LITES

Langley Information Technology Enhanced Services Presolicitation Conference

Langley Research Center

November 9, 2009

Agenda

8:30	Presentations
12:00	Lunch
1:15	Tour
4:15	Tour and Conference Complete

Agenda for Presentations

Introduction	Tom Brinkley	8:30
SOW		
Contract and SOW Overview	Tom Brinkley	8:40
Central Storage System	M. Ambur/K. Costulis	8:55
Business Computing	Connie Basnett	9:15
Geographic Information Systems (GIS)	Brad Ball	9:35
Break		9:55
SOW		
High Performance Computing	Joe Morrison	10:05
IT Security	John Evans	10:30
Central Web and Database Servers	John Evans	10:40
Geometry Laboratory/DVAL	Pat Kerr	10:50
ATOS and ATOL	Brian Bixler	11:10
Procurement Specifics & Due Diligence	Robert Rice	11:30

Questions and Answers

- Limited questions may be asked at the end of each presentation
- Limited questions during the tours that relate to the facility, equipment, or work being performed in that area will be taken from the floor
- We will answer as many questions as possible today at the conference; however, we may request that you submit your question(s) in writing
- Questions related to the DRFP terms and conditions, evaluation criteria, or SOW will be answered in writing and posted to the Bidders Library and, as appropriate, will be reflected in the final RFP itself

LITES

Introduction

Thomas H. Brinkley
Office of the CIO

Langley Research Center

Infrastructure/Facilities

- 788 acres, 205 Buildings
- $3.3 B replacement value

Founded in 1917

1st civil aeronautical research laboratory

$650.7M Budget for FY10

FY10 Workforce

~1,900 Civil Servants Full Time Equivalents

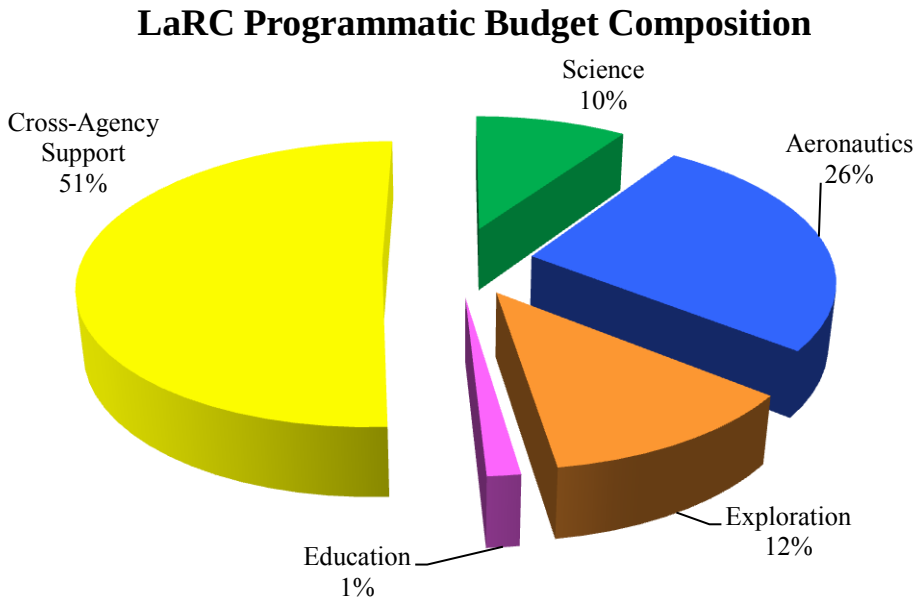
~1,800 On/Near-site Contractor Workyears

Langley's National Impact (2008)

- Economic output of ~ $2.2B annually
- Generates 18,200 high-tech jobs
- Invests over ~$22M in higher education institutions

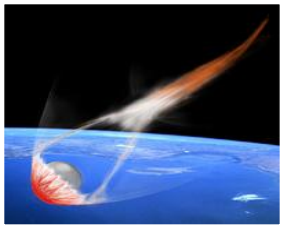
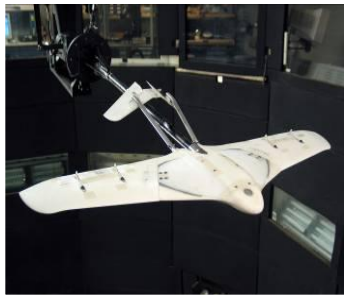
Langley's Virginia Impact (2008)

- Economic output of ~ $1.1B annually
- Generates 9,600 high-tech jobs

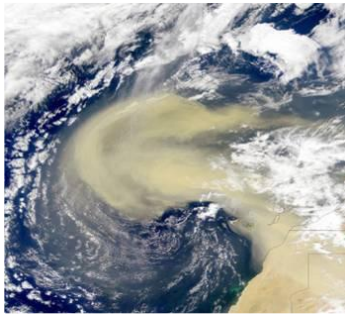


NASA Langley Core Competencies

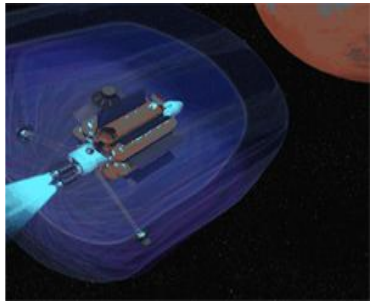
Aerosciences
Research for Flight in All Atmospheres
(Includes Entry, Descent & Landing)


Characterization of all Atmospheres
(Agency = Lasers & LIDAR)

Aerospace Systems Analysis





Aerospace Structural and
Material Concepts

LaRC IT Environment

Users
- 1,900 Employees
- 1,800 Contractors
- ~250 Students

IT Spending
- ~$60M annually (Mission and Mission Support)

Systems/Applications
- > 400 Applications
- NOMAD Email:
  4300 accounts

Desktop/Workstations
- 50% Windows
- 20% Mac OS
- 30% Unix

Network
- ~9000 network connections
- 10Gb/sec backbone
- Internal: Single internal LAN
- External: Several DMZs
  - Remote access: VPN
  - Public, wireless, and guest networks
- WAN: NISN

Data Center
- Central Server Data Center
  - Central web, database, & application servers
  - Shared mid-range cluster (3000 cores)
  - Central storage system (~1.2PB)
- Atmospheric Science Data Center
- Multiple distributed clusters

Websites (375 total)
- 175 public; 200 internal

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Contract and SOW Overview

Thomas H. Brinkley
Office of the CIO

Contract Overview

- SOW functional areas:
  - IT Support Services
  - System & Application Development Services
  - Work-Area Specific Services
- Task Orders (TO's) issued for specific work within the SOW scope
- Each TO has specific requirements & awarded value
  - Each TO customer-funded, with TO cost vs. funding to be tracked
  - Funding limitation applicable at contract level; however, all TO's must be fully funded
  - Monitored separately (semi-annual & annual written performance evaluations by Technical Monitor)
  - Financial & technical performance reported on monthly basis

Contract Overview (cont'd.)

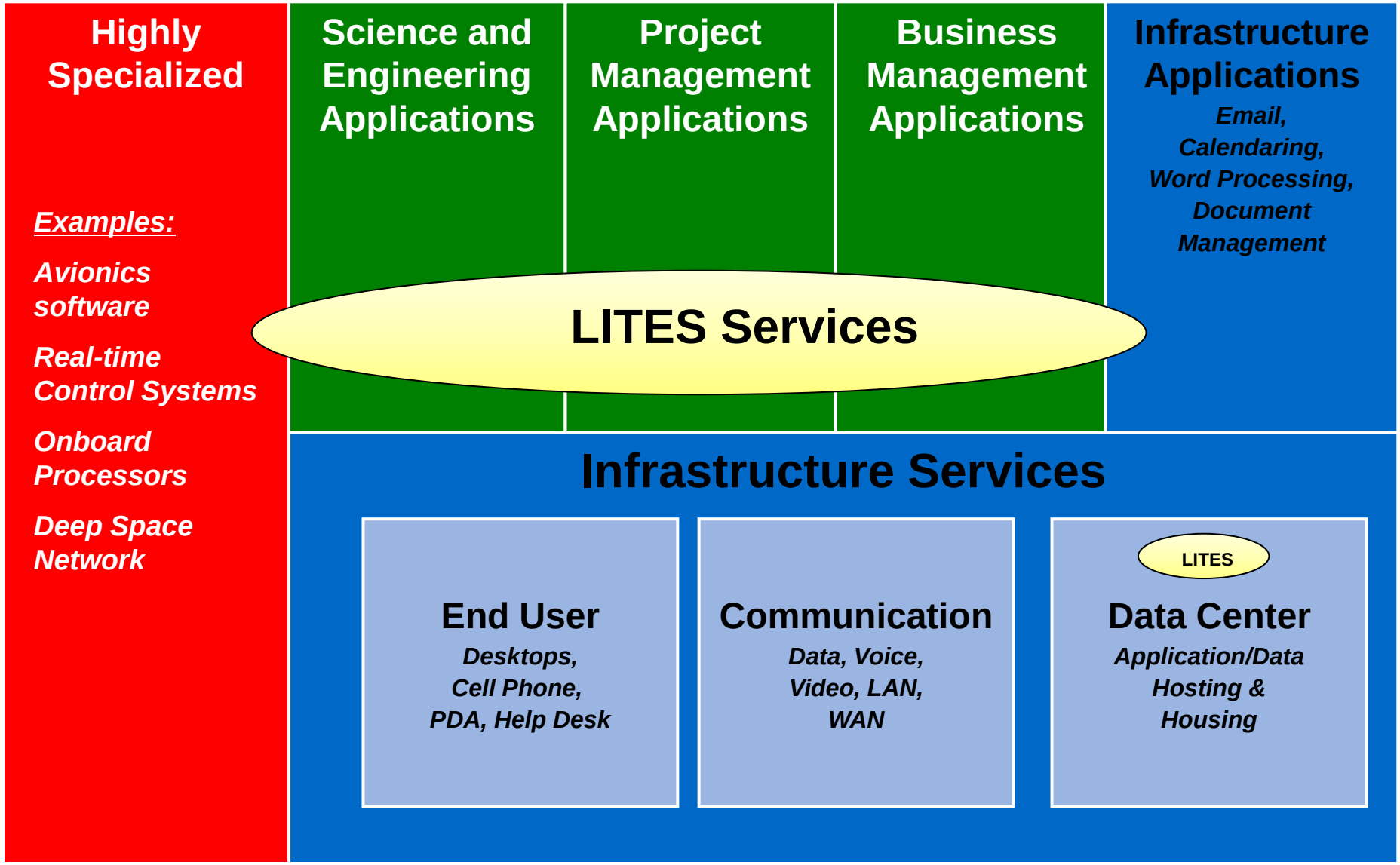
- Currently about 90 active Task Assignments
- Contract divided roughly equally between—
  - Research Computing & Advanced Engineering, e.g., Geometry Modeling and Grid Generation, Geographic Information System (GIS), Airspace and Traffic Operations Simulation (ATOS)
  - System administration (SA) & IT Services & Support, e.g., IT Security, Organizational SA, Central Storage System (CSS)
  - Enterprise Applications, e.g., Integrated Enterprise Management (IEM) Applications, Software Engineering Process Group (SEPG), Web Development & Database Services

Major LITES Customers

These organizations are expected to account for about 90% of the services provided under LITES:

- Mission Organizations
  - Research & Technology Directorate
  - Center Operations Directorate
  - Systems Engineering Directorate
- Mission Support Organizations
  - Office of Chief Information Officer
  - Office of the Chief Financial Officer

Scope of NASA's IT Infrastructure



Scope of LITES

- LITES contract will provide IT support services in the areas of:
  - Science and Engineering Applications
  - Project Management Applications
  - Business Management Applications
  - Center Infrastructure Applications not in I^3P scope
  - Data Center Support not included in I^3P or in later Waves of NEDC
- LITES will provide IT support on- and near-site at LaRC:
  - Integrated system administration and application management that is a critical component of complex research and development efforts. These efforts require applications knowledge and experience for the area of research and a high level of interaction with application developers and technical users
  - Application development for systems that are dedicated to Science and Engineering, laboratory, and mission-support systems.
  - Hardware and software maintenance for systems that are either uniquely configured or highly specialized in function.
- Variability of IT solutions drives the need for varying levels of expertise (often very advanced) for high-end, complex systems and applications.

Projected LITES Support Areas

- OCIO IT requirements
  - Centralized Web and Database Servers
  - Digital Library System
  - Large Scale Data Storage and Retrieval System
  - Central Computer Facility Environmental Monitoring
  - IT Security
- Specialized IT to support research, engineering, and business-related efforts, for example:
  - High Performance Computing and Distributed Systems
  - Geographic Information Systems
  - Airspace and Traffic Operations Simulation (ATOS) Development and Enhancements
  - Geometry Modeling and Grid Generation
  - Data Visualization and Image Processing
  - Administrative Business Applications/Support
  - Computational Analysis and Programming Services
  - World Wide Web Application Support
  - Data Reduction and Data Management Support

LITES Scope in Relation to I^3P Acquisitions

- The overlap of the scope of LITES and the I^3P contracts is limited:
  - ACES: No overlap as Center has completed transition of systems that need to be supported under ODIN
  - NICS: Minimal potential overlap in network perimeter protection. Will reevaluate use of LITES after NICS implementation
  - NEDC: Possible minimal overlap in OCIO-provided services in Waves 2 or 3. Will reevaluate use of LITES after NEDC implementation
  - WEST: No overlap as services not being performed at LaRC
  - EAST: No overlap with LaRC environment

General SOW Requirements

- Place of Performance
  - LaRC On-site (~50%)
  - Contractor site (~50%)
  - Non LaRC locations
- Hours of Operation
  - 8-hr shift starting 7 am or later, M--F
  - Task Order may specify acceptable/required variability
- An electronic task order system (ETOS) will be used to initiate new TO's, to route TO's through the approval process, to record award information, and to administer funding and performance of TO's once they are in place
- Contractor is required to use ODIN for on-site desktop systems connected to LaRCNet
- Off-site connectivity to LaRCNet is by VPN

LITES

Central Storage System (CSS)

Manjula Ambur and Kay Costulis
Information Management Branch
Office of the CIO

CSS Outline

- Overview
- Services
- Architecture
- Current Usage
- Upgrades in Progress
- Support Requirements

CSS Overview

- Large-scale, centrally managed data and information storage system based on HPSS (High Performance Storage System) software by IBM
- Management by the Information Management Branch (OCIO)
- Current capacity is ~ 5 Petabytes of data: combination of tape and disk storage (primarily tape storage)
- Primarily used for mission data: working files, long-term storage, and backups. Data consists of:
  - Computational data, wind tunnel test data, IT security logs, digital documents and multimedia files etc.
- Can ingest over 10TB of data in one day
- Dual-copies of data are stored offsite for disaster recovery
- All tapes are encrypted (AES-256)

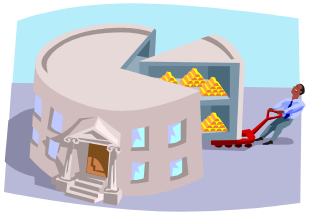
CSS Services

CSS is a central electronic data and information storage system at Langley providing services to all Center Mission and Mission Support offices.
Functions include:

Protection of Information:

Backups of IT systems - Copies (locally and off-site) created for the recovery of information stored in Center IT systems

Preservation of Information:



– Archival of unpublished program/project information, and test and computational data to be retained, often for long periods of time, and accessible for the Center's reuse

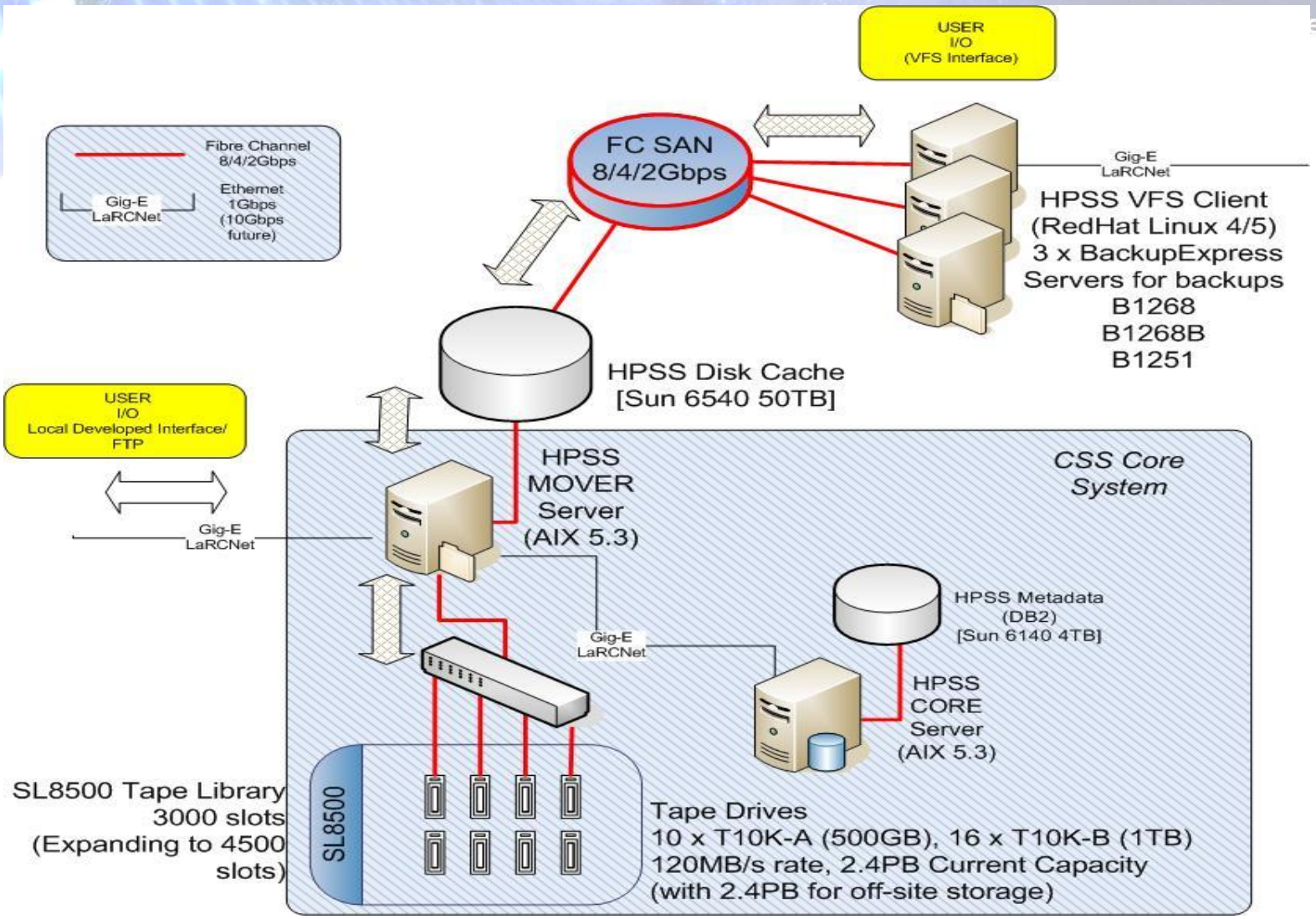
Stewardship by a persistent/institutional organization to maintain the information even after the information creator is gone

Accessibility of Information:

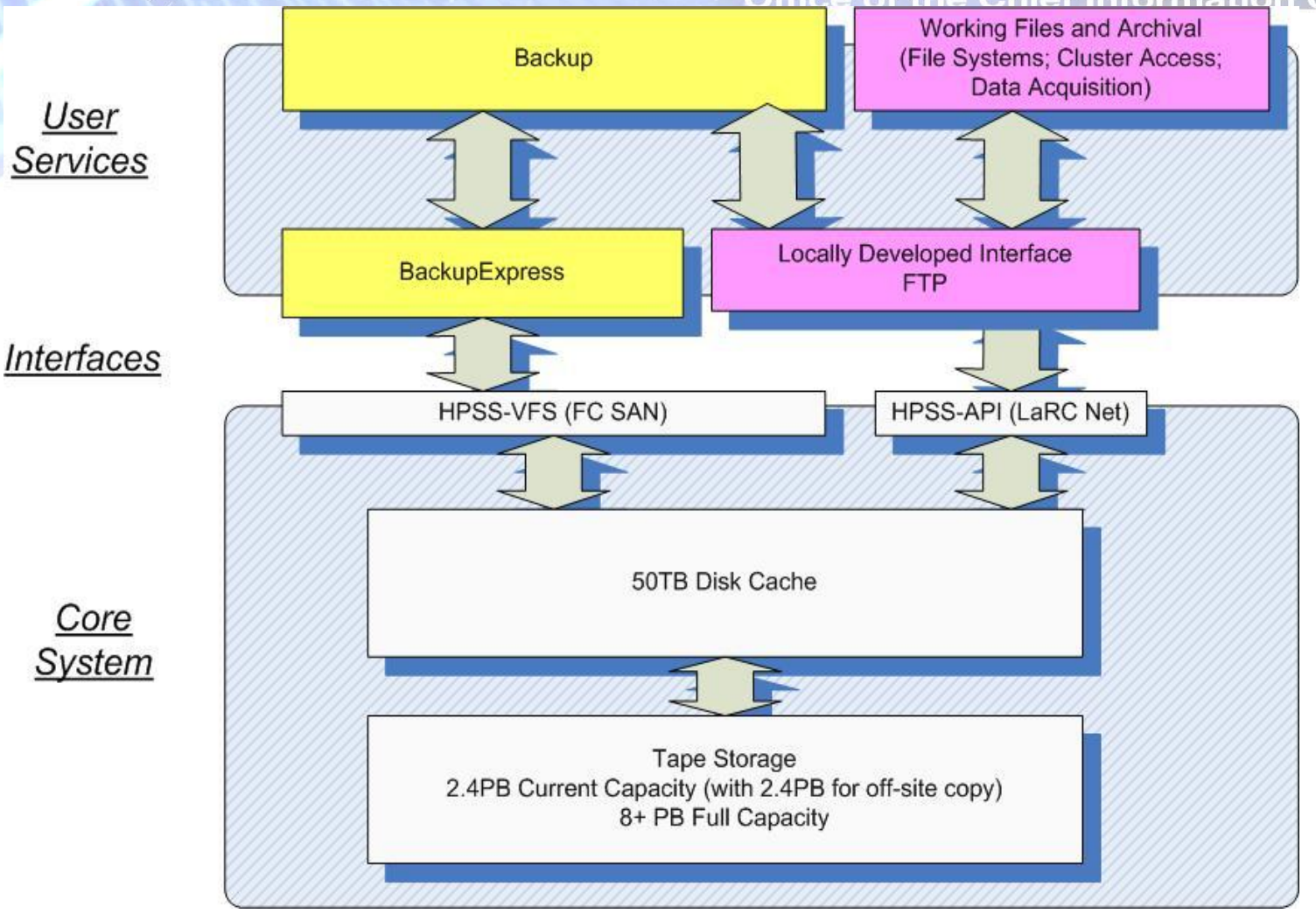
Storage of Working Files

- Active information and test and computational data associated with the ongoing collaboration within programs or projects
- Other finite-term data storage supporting distributed, organizational computing systems

CSS Core Architecture



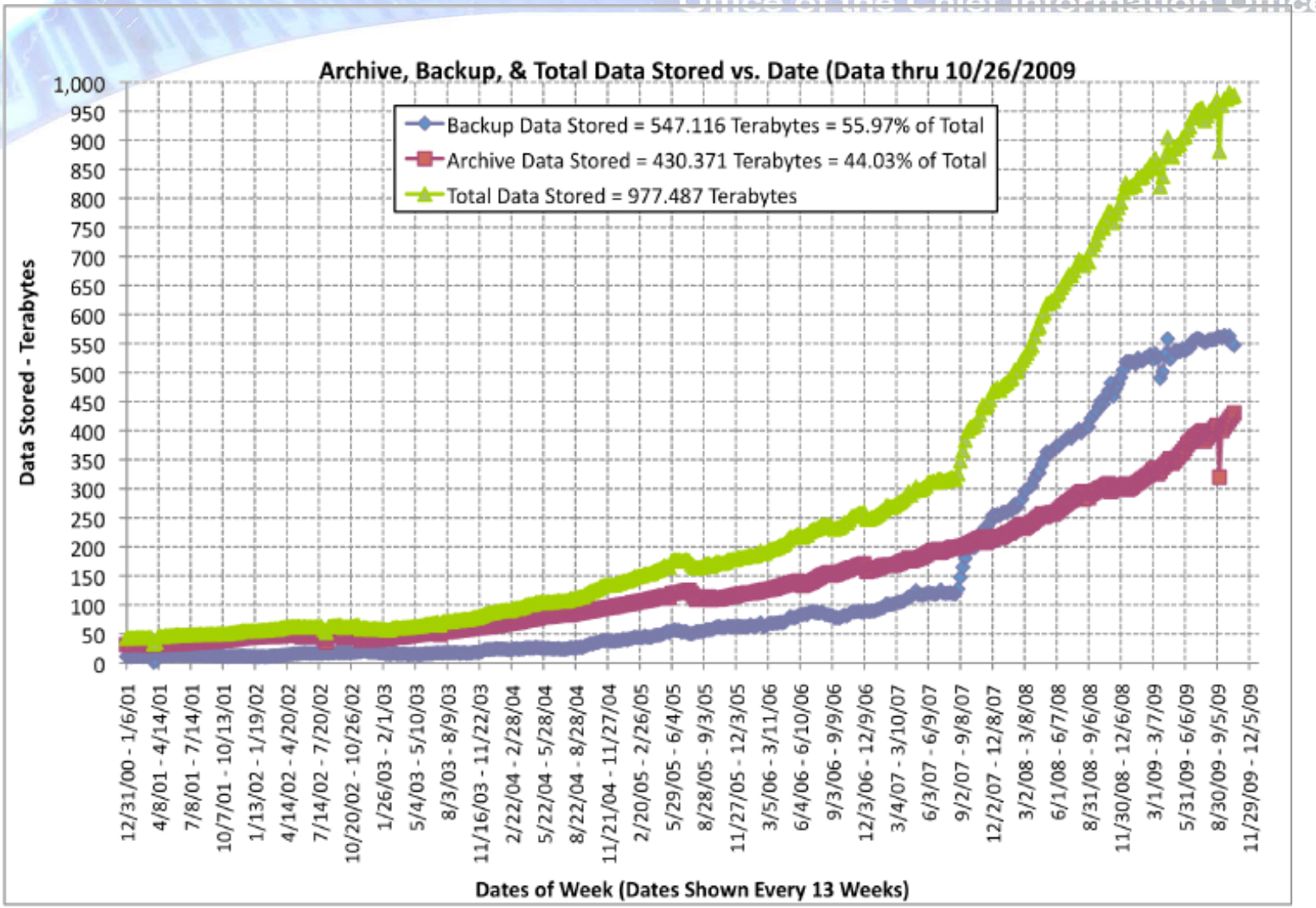
CSS Functional Architecture



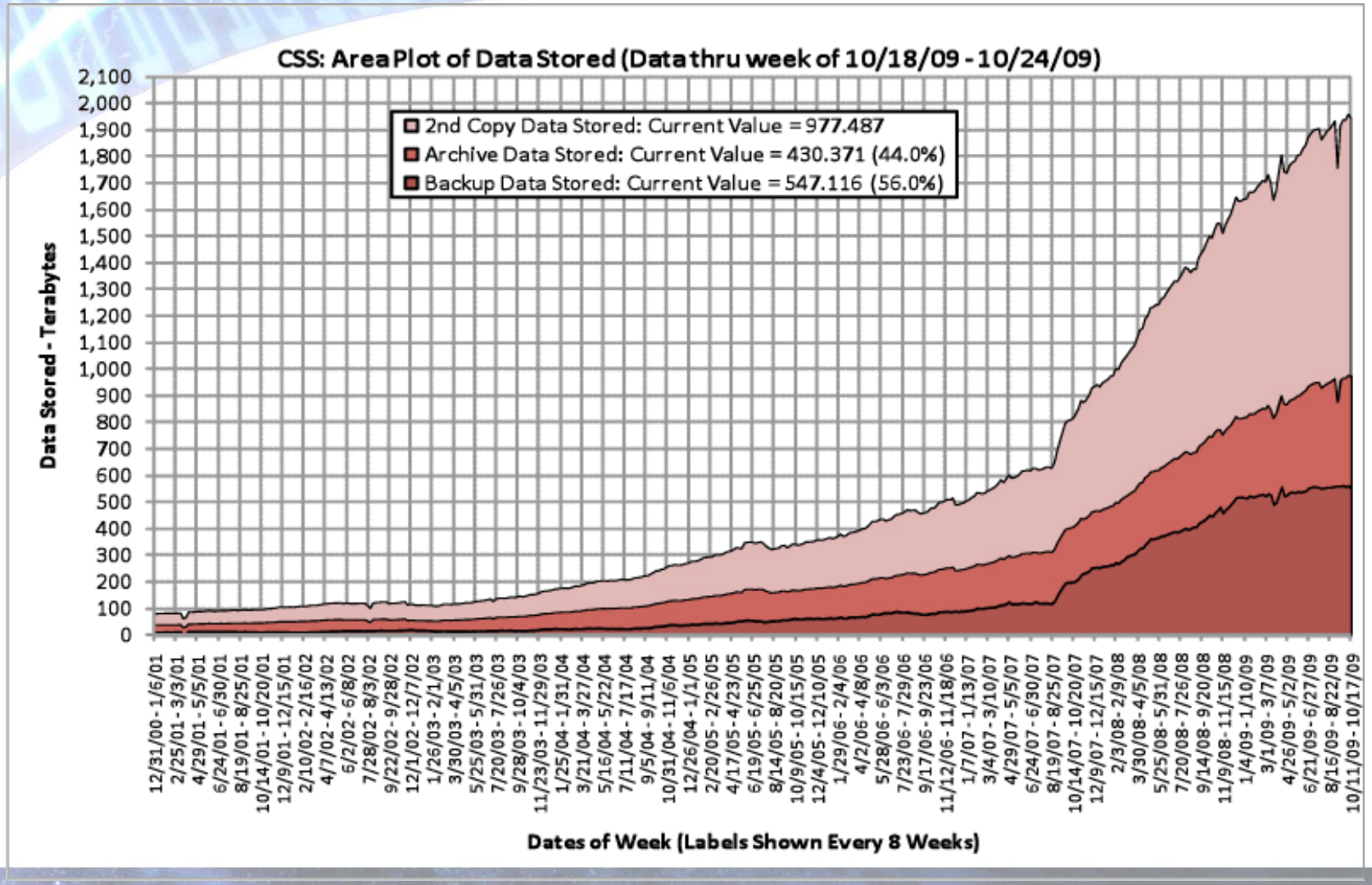
CSS Current Usage

- User, Client, Storage Utilization:
  - 500 Registered Users
  - 500 Client desktops and servers (not all client machines send and retrieve data daily)
  - ~ 1 Petabyte Data Stored with ~ 1 Petabyte for off-line storage
    - 56% Backup; 44% Working files & long-term storage
  - ~ 6.4 Million Files (7% Backup and 93% Working files & long-term storage)
- Daily Traffic
  - Transfers to/from CSS: 5,000 -130,000 files
  - Daily Data Volume (i.e., Daily Traffic): 8-9 Terabytes
  - Data Volume per Transfer: ~ 2.2 Gigabytes

Data Stored on CSS



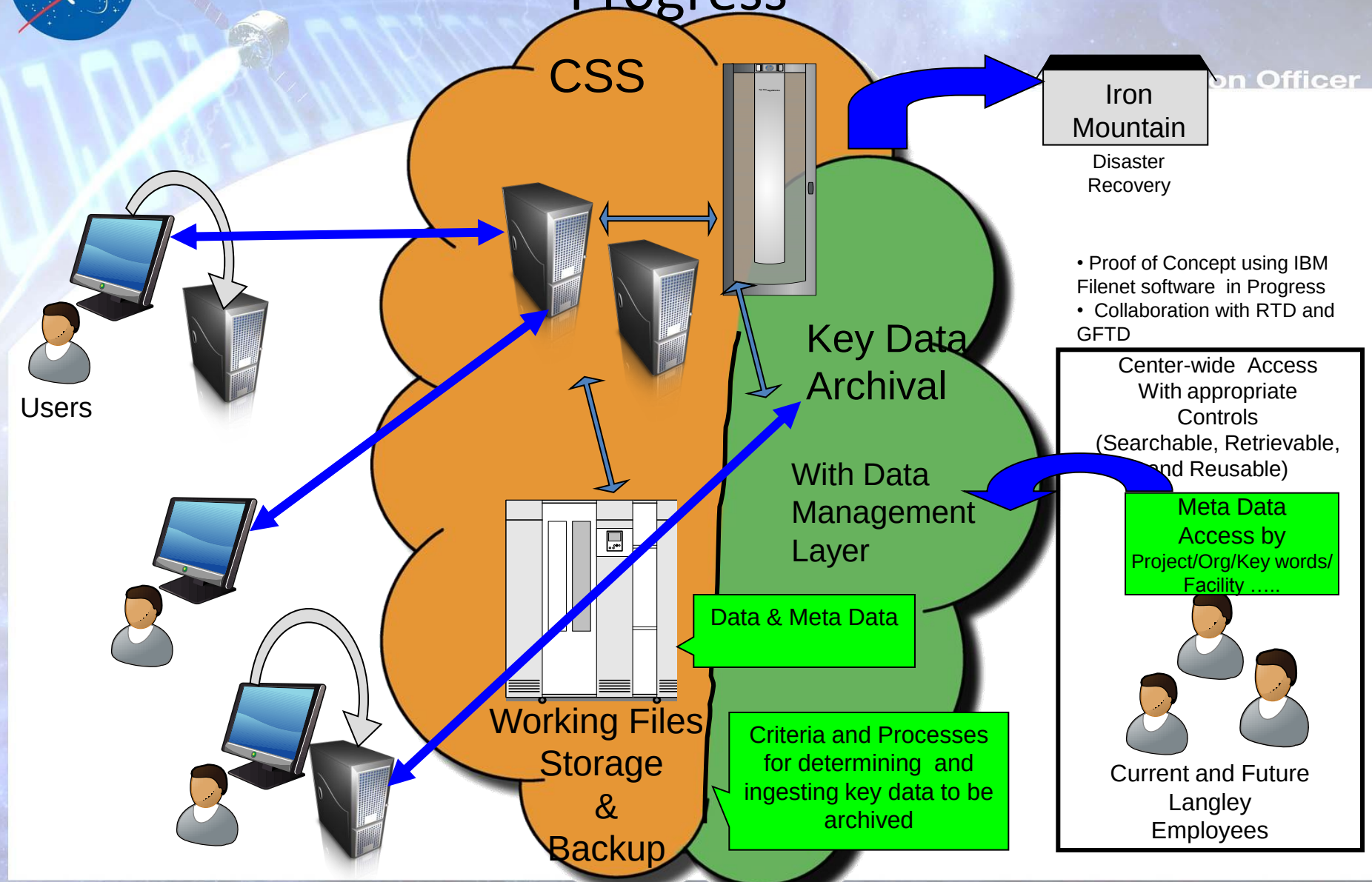
Data Stored on CSS



CSS System Upgrade Plans

- Hardware:
  - Upgrading tape drives to T10000B drives to double storage capacity from 2.4 PB to 5.0 PB
  - Upgrade tape library expansion from 3000 slots for 4500 slots
- Software:
  - Upgrade HPSS v7.1
  - Utilize Central User Authentication to implement simple sign-on
  - Provide Secure FTP support
  - Upgrade to new tape encryption

CSS Functionality: Data Archival Solution In Progress



CSS Support Team Requirements

Core Skills:

- Expertise in the following:
  - Unix Administration: AIX, Solaris, Red hat, Linux, SUSE
  - HPSS configuration and administration
  - BackupExpress (BEX) administration
  - Hardware installation and configuration (Servers, Storage devices, Network devices etc)
  - Fibre Channel and Ethernet
  - Data Management software configuration
  - Systems programming in C, Perl, TclTK, and Java
  - Customer support and outreach

Core Services:

- Provide 24x7 system management: operations, monitoring and service (98% uptime requirement)
- Provide customer support : 8X5 helpdesk support for account management, trouble shooting, user assistance etc; outreach to increase CSS utilization
- Provide and test a disaster recovery plan and provide necessary services for LaRC to execute it successfully
- Provide data archival expertise: configuration, design and system administration services and support for the archival of Center's mission data
- Integrate new data storage upgrades: plan, develop, and execute and provide user-transparent transition of data through technology upgrades and refresh
- Interface effectively with IT Network and Security teams as a user and service provider
- Maintain a test system for testing hardware and software upgrades and prototyping new features
- Recommend new requirements : stay abreast of rapidly changing mass storage technologies; Participate in related technical society and user forums
- Develop and test needed user and system tools

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Business Computing

Connie Basnett
Office of the CFO

Services and Requirements

- Compliance with Operations Level Agreement with the NASA Enterprise Applications Competency Center (NEACC)
  - Center Business Process Leads
  - Business Readiness
  - Reporting
  - Security
  - Training
  - Support Super Users
- Assist in the local deployment of Agency-wide systems and/or upgrades
- Design, develop, and deploy Center systems and/or upgrades
- Develop, maintain, and administer web-sites and dashboards
- Recommend and deploy process improvements
- Develop and maintain user and technical documentation

Services and Requirements (Continued)

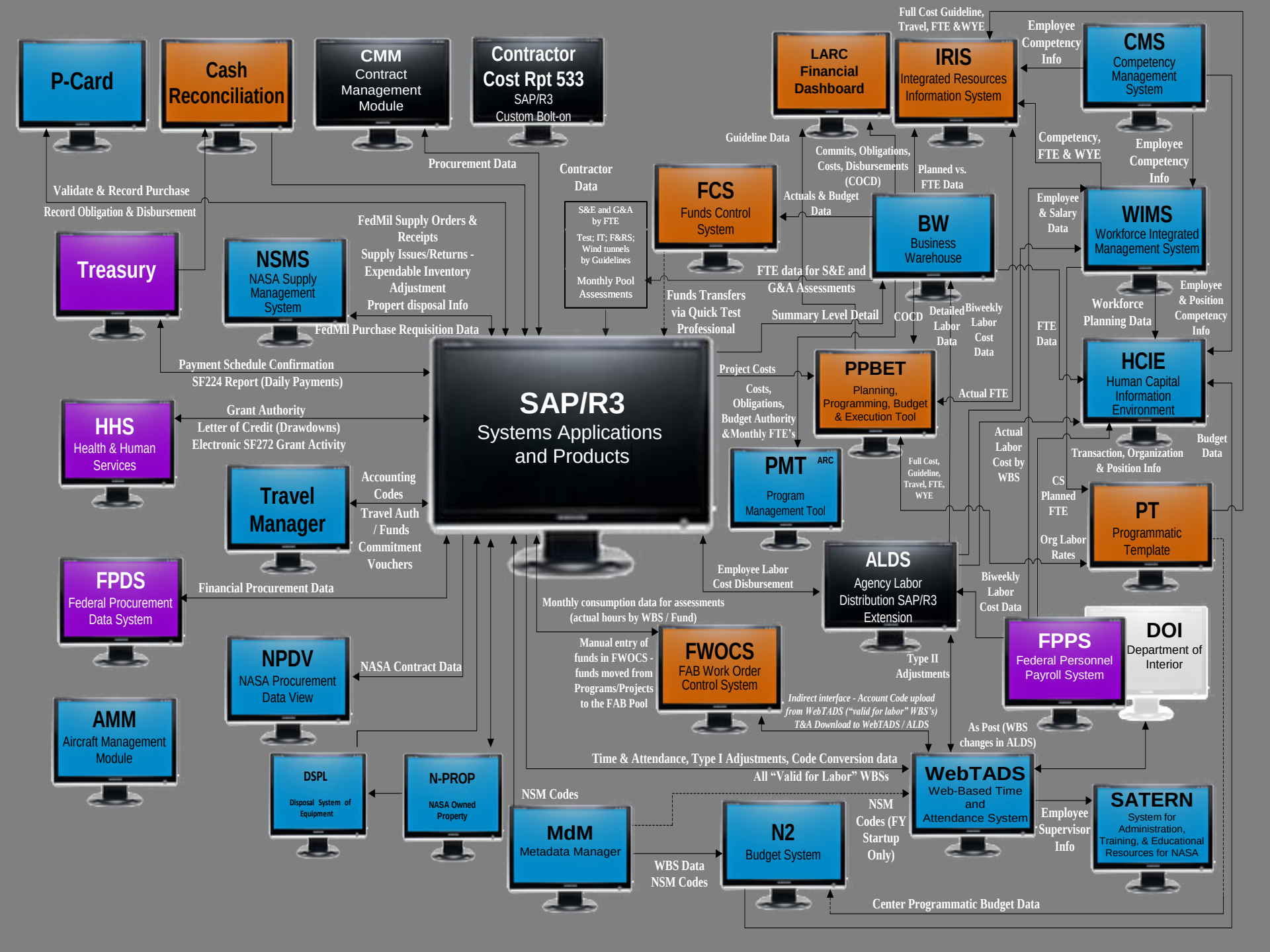
- Provide help desk (Tier 2) support for business applications
- Test Agency and Center applications
- Participate in Agency teleconferences, user forums, and status briefings
- Provide project coordination support to the Langley Research Center Office of the Chief Financial Officer
  - Meeting minutes
  - Action items
  - Maintenance of project documentation
  - Meeting materials

Services and Requirements (Continued)

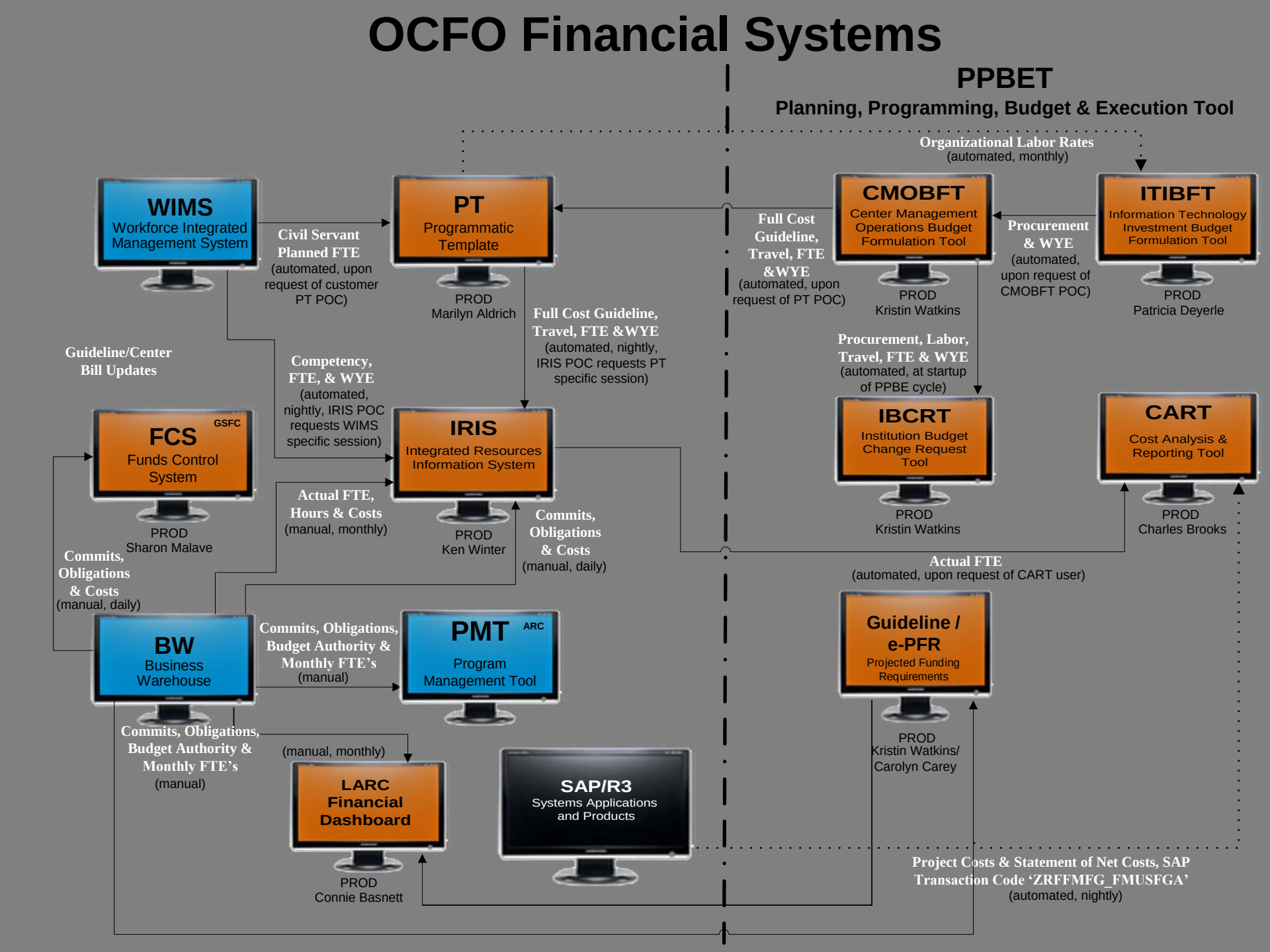
- Financial systems analysis support to the Office of the Chief Financial Officers' Financial Management and Resource Management offices
  - Extract data and analyze data from SAP's Business Warehouse
  - Define reporting metrics for Center performance
  - Identify reports to aid in financial and resource management decisions
  - Assist in reconciling property accounts reported in SAP to NASA legacy systems

Key Customers

- OCFO (Financial Management, Resource Management, Financial Systems Management)
- Langley resource analysts; organizational and project managers
- NASA Enterprise Applications Competency Center


P-Card
Cash Reconciliation
CMM
Contract Management Module
Contractor Cost Rpt 533
SAP/R3
Custom Bolt-on
LARC Financial Dashboard
IRIS
Integrated Resources Information System
CMS
Competency Management System
Full Cost Guideline, Travel, FTE &WYE
Employee Competency Info
Guideline Data
Commits, Obligations, Costs, Disbursements (COCD)
Planned vs. FTE Data
Competency, FTE & WYE
Employee Competency Info
Procurement Data
Contractor Data
Validate & Record Purchase
Record Obligation & Disbursement
FCS
Funds Control System
Actuals & Budget Data
BW
Business Warehouse
Employee & Salary Data
WIMS
Workforce Integrated Management System
Treasury
NSMS
NASA Supply Management System
FedMil Supply Orders & Receipts
Supply Issues/Returns - Expendable Inventory Adjustment
Propert disposal Info
FedMil Purchase Requisition Data
S&E and G&A by FTE
Test; IT; F&RS; Wind tunnels by Guidelines
Monthly Pool Assessments
Funds Transfers via Quick Test Professional
FTE data for S&E and G&A Assessments
Summary Level Detail
COCD
Detailed Labor Data
Biweekly Labor Cost Data
FTE Data
Workforce Planning Data
Employee & Position Competency Info
Payment Schedule Confirmation
SF224 Report (Daily Payments)
SAP/R3
Systems Applications and Products
Project Costs
PPBET
Planning, Programming, Budget & Execution Tool
Actual FTE
HCIE
Human Capital Information Environment
HHS
Health & Human Services
Grant Authority
Letter of Credit (Drawdowns)
Electronic SF272 Grant Activity
Costs, Obligations, Budget Authority &Monthly FTE's
PMT
ARC
Program Management Tool
Full Cost, Guideline, Travel, FTE, WYE
Actual Labor Cost by WBS
Transaction, Organization & Position Info
Budget Data
CS Planned FTE
Travel Manager
Accounting Codes
Travel Auth / Funds Commitment Vouchers
PT
Programmatic Template
Org Labor Rates
FPDS
Federal Procurement Data System
Financial Procurement Data
Employee Labor Cost Disbursement
ALDS
Agency Labor Distribution SAP/R3 Extension
Biweekly Labor Cost Data
Monthly consumption data for assessments (actual hours by WBS / Fund)
FPPS
Federal Personnel Payroll System
DOI
Department of Interior
NPDV
NASA Procurement Data View
NASA Contract Data
Manual entry of funds in FWOCS - funds moved from Programs/Projects to the FAB Pool
FWOCS
FAB Work Order Control System
Type II Adjustments
Indirect interface - Account Code upload from WebTADS ("valid for labor" WBS's)
T&A Download to WebTADS / ALDS
As Post (WBS changes in ALDS)
AMM
Aircraft Management Module
Time & Attendance, Type I Adjustments, Code Conversion data
All "Valid for Labor" WBSs
WebTADS
Web-Based Time and Attendance System
DSPL
Disposal System of Equipment
N-PROP
NASA Owned Property
NSM Codes
MdM
Metadata Manager
N2
Budget System
NSM Codes (FY Startup Only)
Employee Supervisor Info
SATERN
System for Administration, Training, & Educational Resources for NASA
WBS Data
NSM Codes
Center Programmatic Budget Data

OCFO Financial Systems



Future Initiatives

- Documentation, maintenance, and enhancements to the business system architecture
- Deployment of governance model for business processes and systems
- Deployment of new or enhanced Agency-wide or Center business computing systems

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Geographic Information Systems (GIS)

William B. Ball

Center Operations Directorate

GIS Presentation Posted Separately as “GIS Presolicitation Conference Slides”

LITES

Branch Systems and Cluster Support

Joseph H. Morrison
Acting Head
Computational AeroSciences Branch (CASB)

System Configuration

Cluster of clusters

Servers

Cluster backbone

Center cluster

Firewall

LaRCNet

Foreign national cluster

Workstations

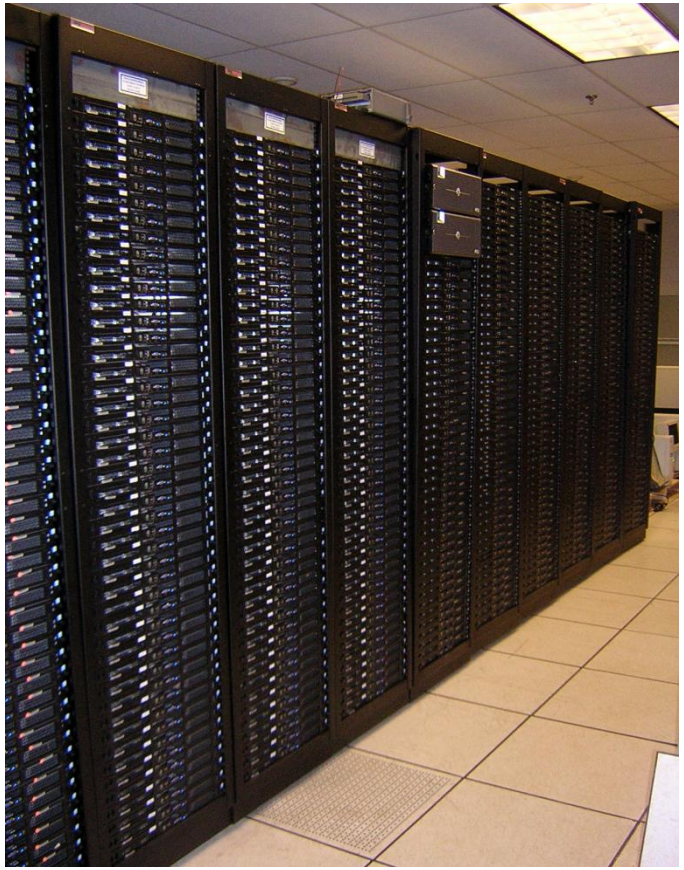
Multi-OS Notebooks

Servers

- File servers
- Boot servers
- Backup servers
- Special purpose compute servers
- Development servers
- Application servers
- UPS on critical servers

Cluster of Clusters

- Rack mount or boxes-on-shelves
- Commodity hardware
- Compute nodes
  - Single or dual socket
  - 1, 2, or 4 cores per socket
- Interconnection
  - 100 Mb Ethernet
  - Gigabit Ethernet
  - Myrinet
  - 4X DDR InfiniBand
- Diskless or disk configurations
- Netbooted
  - OS may be installed on each node in other branches
- CASB
  - Over 1300 compute nodes with over 1900 compute cores
  - 15 RAID servers with 80 TB storage



Center Cluster

- SGI ICE 8200
- Chilled water cooling
- 384 Compute nodes
  - Dual socket, quad core
  - 3,072 compute cores
- 7 servers
  - 2 login servers
  - 1 batch server
  - 2 administrative servers
  - File server
  - Large memory compute server
- Lustre parallel file system
- Interconnection
  - Gigabit Ethernet for management
  - 4X DDR InfiniBand
- SGI management software
- SGI CUBE Network attached storage

System Overview

- Data includes research data and SBU (ITAR/EAR) data
- Clusters, servers, and workstations tightly integrated
  - Shared /usr/local
  - Shared applications
  - File systems shared with Network File System (NFS)
- Custom cluster netboot scripts written and maintained by contractor staff for diverse, heterogeneous cluster of clusters
  - Scripts manage setup, maintenance, and monitoring
  - Used by other clusters at LaRC
- Custom firewall scripts written and maintained by contractor staff
  - Isolate a Foreign National Cluster from LaRCNet to allow Foreign Nationals to interact with NASA researchers
  - Strictly control access to/from specific systems and services
- Backup services provided to file servers, workstations, and laptops
  - 54 tape LTO III library
  - Bakbone software
- Linux update server to facilitate system patch updates
  - Also used by other LaRC groups
- IPMI, Lights out management

Operating System Environment

- Install, maintain, patch, upgrade, maintain security, provide assistance for the following Operating Systems
  - Linux – CentOS, SUSE, RHEL, Fedora, …
  - Solaris
  - Irix
  - Windows
  - Macintosh OS X
  - Multiple OS machines (dual-/multi-boot, virtualization software)
- Custom Linux kernels required to:
  - Provide netboot capability
  - Support specialized hardware such as Myrinet
  - Optimize system performance for hardware; minimize memory footprint
- High performance journaling file systems to increase performance and data integrity
  - Reiserfs, jfs (IBM), xfs (SGI)
- Lustre Parallel File System
- Virtualization Software (VMWare, etc.)
- Software Management
  - Modules
- Job queuing software
  - PBSPro, …

Software Development Environment

- Install, maintain, and provide assistance for development tools
- Requires multiple revisions of these tools be maintained for compatibility
- Compilers – Fortran and C/C++
  - Intel, Portland Group, Lahey-Fujitsu, Absoft, gcc, gfortran, …
- Scripting Support
  - Python, Perl, Ruby, csh, bash, …
- Debuggers
  - Totalview, Intel Debugger (idb), GNU Debugger (gdb, ddd), Valgrind, …
- Libraries
  - MPI (Message Passing Interface)
    - LAM, MPICH, OpenMPI, MPICH2, MVAPICH, …
    - Requires compilation with special network driver support (e.g. Myrinet)
    - Version needed for each compiler
  - OpenMP
  - Intel Math Kernel Library (MKL)
  - Intel Threading Building Blocks (both commercial and open source)
- Optimization
  - Intel Vtune
- Software Version Control
  - CVS, tkCVS, SVN, tkSVN, git, …

Application Software

- Install, maintain, and provide assistance for commercial and open source applications
- Grid Generation
  - Gridgen, GridEX, …
- Visualization
  - Tecplot, Fieldview, plot3d, gnuplot, mplayer, mencoder, …
- Symbolic Manipulation
  - Mathematica, Maple, Matlab, JMP, …
- Document Preparation
  - Tex, Latex, Lyx, OpenOffice, …
- Custom Software
  - Libraries (Metis, Parmetis, …)
  - NASA Codes (FUN3D, CFL3D, Overflow, …)

Hardware Support

- Assist in research and planning of new hardware
  - Space, power, cooling requirements; performance; support
  - New hardware architectures e.g. GPUs, FPGAs,
- Install new hardware
  - Assist in delivery; install hardware in racks; cable; install and provision OS, applications, and queuing software
- Maintain systems
  - Identify performance problems and formulate solutions
  - Monitor for failed systems; confirm failures with vendor supplied or other diagnostics tools; notify vendor; install replacement components/coordinate vendor replacement; assist in returning failed components to vendor
  - Develop method to economically maintain old hardware
- Upgrade
  - Assist in identifying bottlenecks and solutions
  - Perform upgrades to hardware that NASA acquires (additional memory, disk drives, accelerators, GPUs, …)
- Excess
  - Assist in excessing old or failed systems that are not economically feasible to repair

New Technology Support

- Assist in researching, planning, and adopting new technologies
- High Performance File systems
  - Lustre, GPFS, Panasas, …
- Processors
  - AMD, Intel, IBM, …
- Accelerators
  - FPGAs, GPUs, GPGPUs, Cell, ASICs, …
- Interconnection
  - 10 Gb Ethernet, 4X QDR InfiniBand, …
- Higher density
  - Cooling, weight limits, …
- New management hardware or software
  - Investigate and evaluate software packages which can improve cluster setup, management and monitoring (e.g. ROCKS+)
  - Enhance lights out management support via hardware/software solutions

LITES

IT Security

John L. Evans
Office of the CIO

IT Security (ITS) Functions

- Caveats
- Incident Response
- Intrusion Detection
- Vulnerability scanning
- Risk Analysis & assessment
- LaRC Center facility-specific firewalls
- IT Security website
- Automating ITS functions
- Coordinate ITS activities with other centers
- Coordinate ITS activities with other contractors

Caveats

- The Agency is currently undergoing an enormous amount of change in the infrastructure environment.
- Some activities may have local management and local implementation currently
- Some may move to central management and local implementation or central management and central implementation

Incident Response

- Number 1 priority when compromise is suspected
- Involves ITS personnel and
  - Office of Inspector General
  - System administrators for affected systems
  - Network Security – key stroke monitoring
  - Line managers, LaRC CIO, data owners
  - Other contract staff

Intrusion Detection

- Network and Host-based
- Public domain software, local scripts, and Agency provided software
- System administration of all monitoring engines
- NESUS Scanner used for system security planning

Vulnerability Scanning

- Scans can be done on an organizational, building, or case-by-case basis
- Foundstone scanner provided by Agency
  - Includes metrics to the Agency regarding targeted vulnerabilities

Firewalls

- Develop, Operate, Maintain perimeter protection
- Main Center firewall
- Other facility specific firewalls
- Will require close coordination with configuration of border routers to provide adequate perimeter protection for LaRC

ITS Website

- Responsible for accuracy and maintenance
- Pertinent information to maintain
  - User information
  - Sysadmin information
  - ITS services
  - Hot topics
  - Virus info
  - Statues, Policies, and Guidelines (SOPs)
  - Computer Security Official (CSO) duties/responsibilities
  - Public Key Infrastructure (PKI)
  - IT Security Planning
  - Foreign National Access to Computers at LaRC
  - Certification & Accreditation (NIST 800 Series)

Automating ITS Functions

- Pro-active technology infusion
- New updates to existing technology
  - VPN updates
  - RSA updates
  - Network Access Control
  - Application testing
  - Etc.

Coordinating ITS Activities with other Centers

- Working groups – PKI, RSA, etc.
- Weekly IT Security Managers (ITSM) telecons
- ITS Registry @ computer-security.nasa.gov
- Reporting quarterly metrics
- Weekly Incident Response telecons

Coordinating ITS Activities with other contractors

- There is considerable interaction with other contractors on center
- Interaction and interface with them on issues
- Communication is key
- Build relationships to ensure ultimate goal is IT security of all systems

LITES

Central Web and Database Services

John L. Evans
Office of the CIO

Central Web & Database Servers (CWDS)

- OCIO provided environment for centrally hosting and housing
- System Administration provided by ConITS
- Multi-faceted environment
- Public/Agency/Center impact

CWDS

- Hosting
  - Data and/or application reside on OCIO managed system
  - All maintenance and support is provided
- Housing
  - Environment provided for different organization system
  - Environment only, no maintenance or support

CWDS

- System Administration includes operations and maintenance of system environment
- Upgrades, patching, user accounts, etc.
- System Security Planning
- Capacity planning
- Monitoring and reporting

CWDS

- Environment comprised of
  - *nix (Solaris and Linux)
  - Windows
  - Mac
- Database
  - Oracle
  - MySQL
  - MS SQL

CWDS

- Public web servers in the DMZ
- Agency applications
- Center applications
- New environment will be based on a zoned architecture
  - Public
  - Extranet
  - Intranet

LITES

Geometry Laboratory/ Data Visualization and Animation Laboratory

Patricia A. Kerr
Advanced Engineering Environments Branch
Systems Engineering Directorate

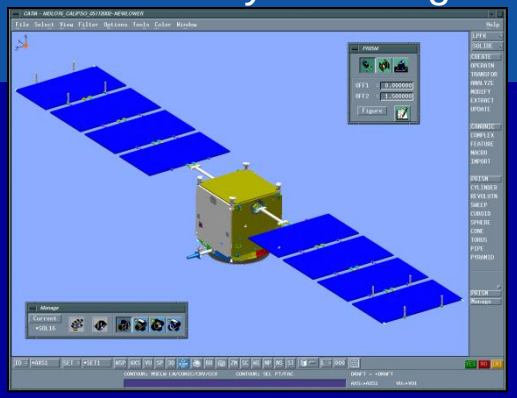
Geometry Laboratory (GEOLAB)

Purpose: To provide expertise in the construction and use of numerical geometries and grids for computational engineering analysis in support of NASA programs and projects.

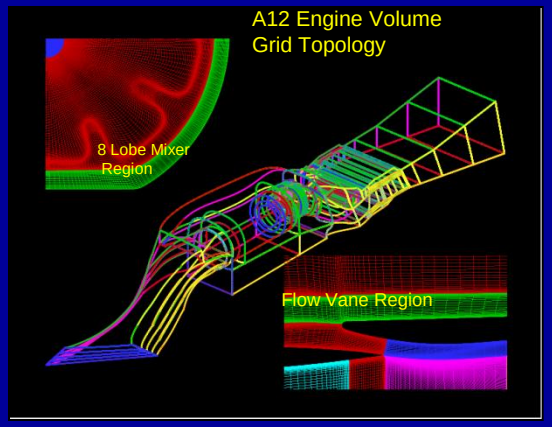
Capabilities:

- Geometry modeling and comparison
- Grid generation for CAE applications
- Reverse engineering to capture “as-built” geometry
- Integrate geometry and grids within analysis and design processes
- Data exchange: mitigation of CAD data conversions and differences in modeling techniques

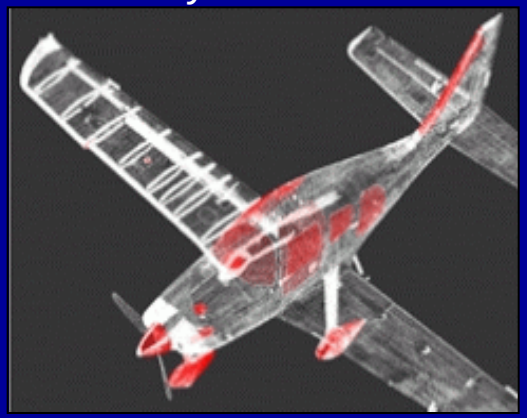
Geometry Modeling



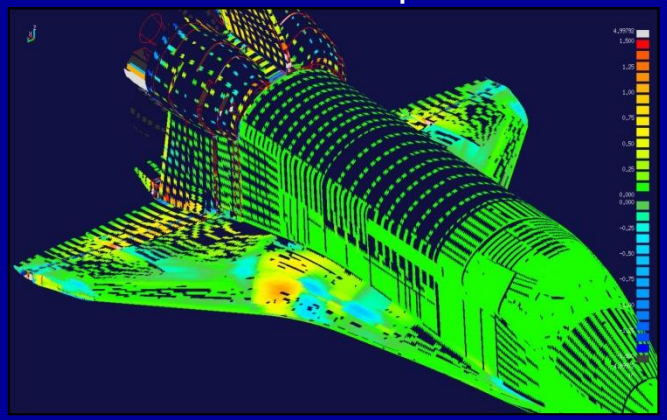
Grid Generation



Geometry Reconstruction



Geometric Comparison



URL:geolab.larc.nasa.gov

GEOLAB

- Facility
  - Located in B1268, RM1051
  - 10 PC & Mac high end workstations
  - 17 node Beowulf cluster with 68 processors
  - Central file servers and 6 TB data storage library
- Task Load
  - Short duration projects – on the order of days to a few weeks
  - Historically, 30-40 projects/yr producing 60-80 geometry and grid products

GEOLAB Production Software Inventory

- Commercial Software

Pro/Engineer, Unigraphics, IDEAS, CATIA 4 and 5	(high end)
ICEMDDN, SolidWorks, Patran	(mid range)
Surfacer, Geomagic	(reconstruction)
CADfix	(repair)
ICEMCFD, Gridgen	(grids)

- NASA Sponsored Software

GridTool, VGRID, GridEX	(unstructured)
Volume2K, TOG, CSCMDO, REGI	(structured)
Alchemize	(data exchange)

Typical Geometry Challenges

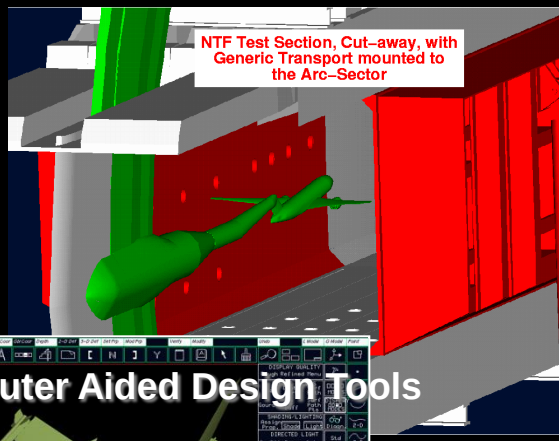
Teams disbursed geographically – multiple centers & industry partners

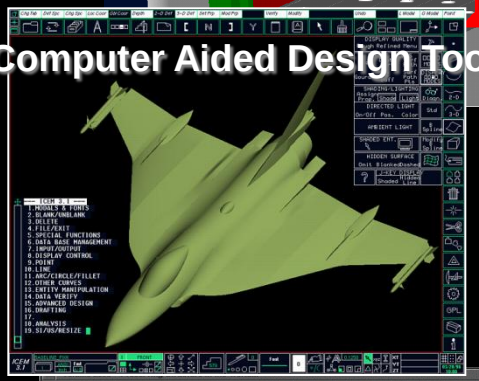
Data exchange issues due to multiple CAD systems and data formats in use

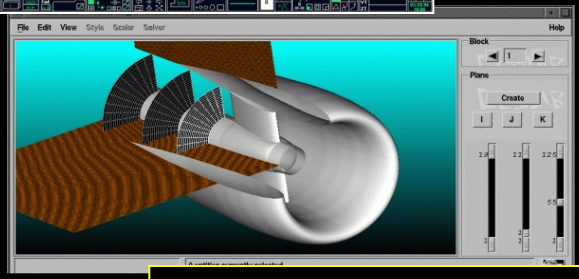
Disparate data requirements – CFD, CSM, visualization, simulation, manufacturing, etc.

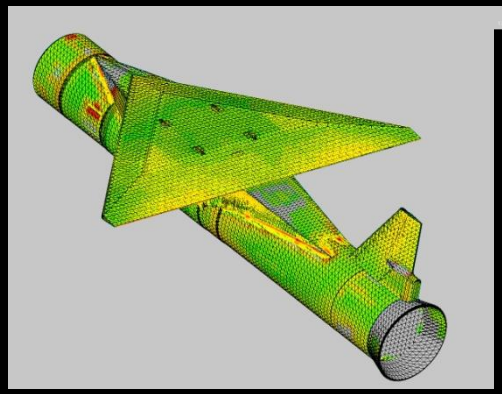
Establishing data pedigree, ie. data origin, quality, & content

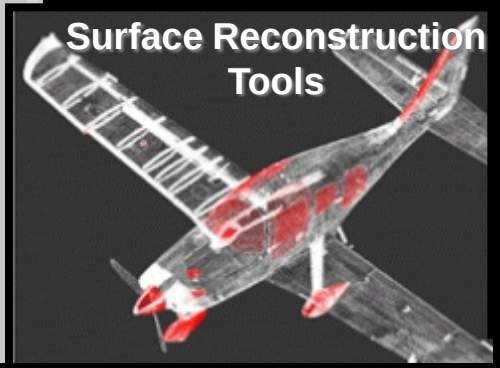
Model complexity – large assemblies, high fidelity, topology simplification

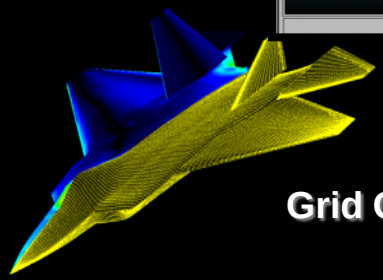


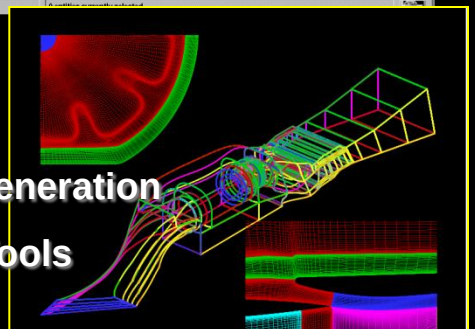






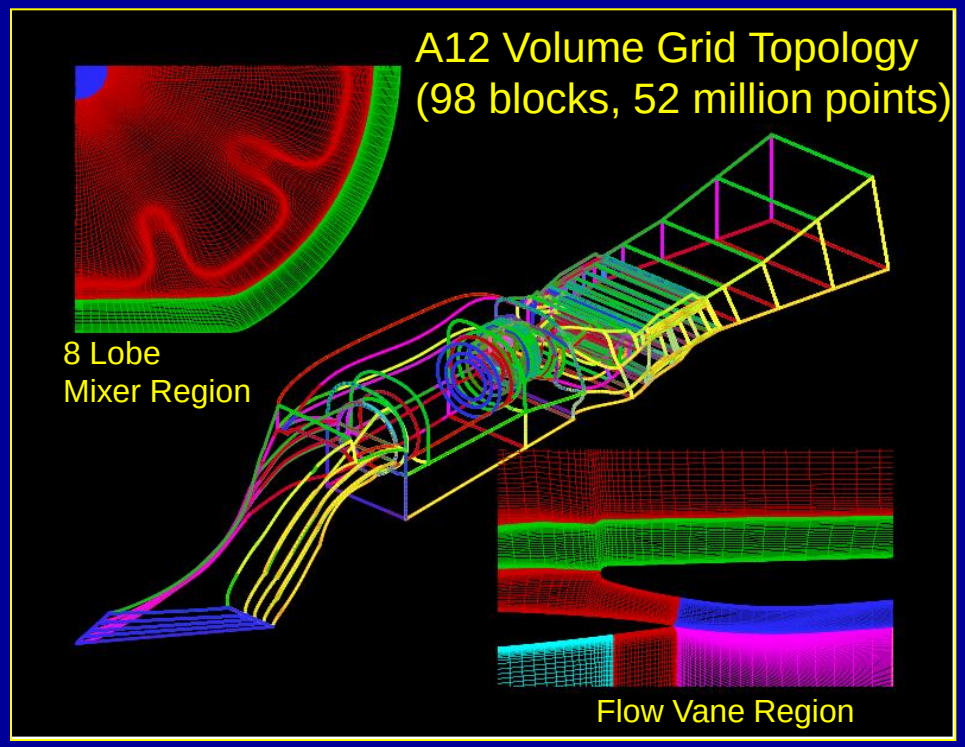




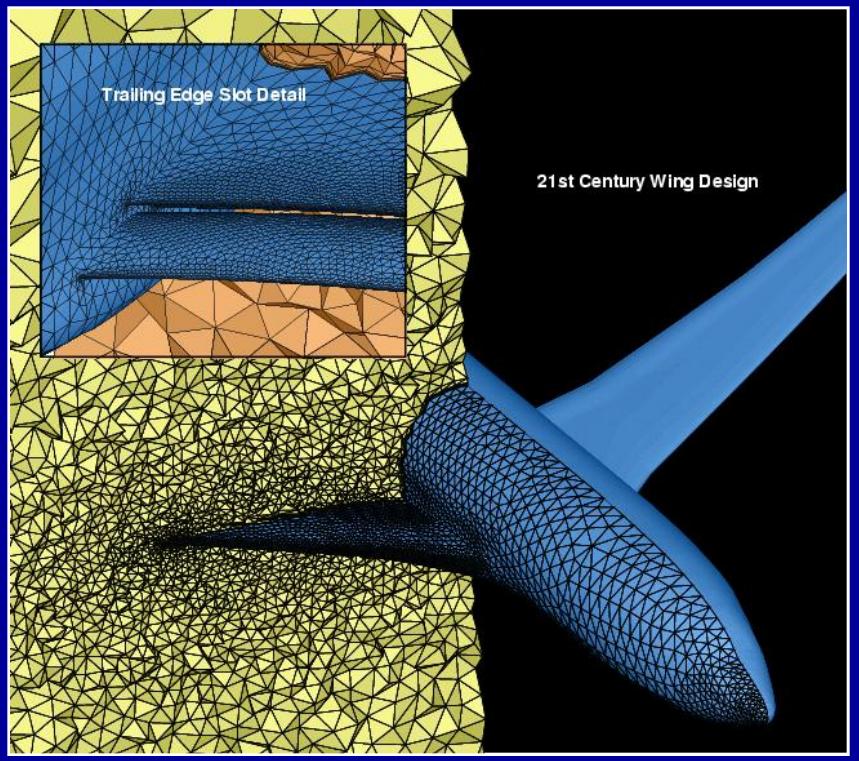


Grid Generation & Modification

Multi-Block Structured



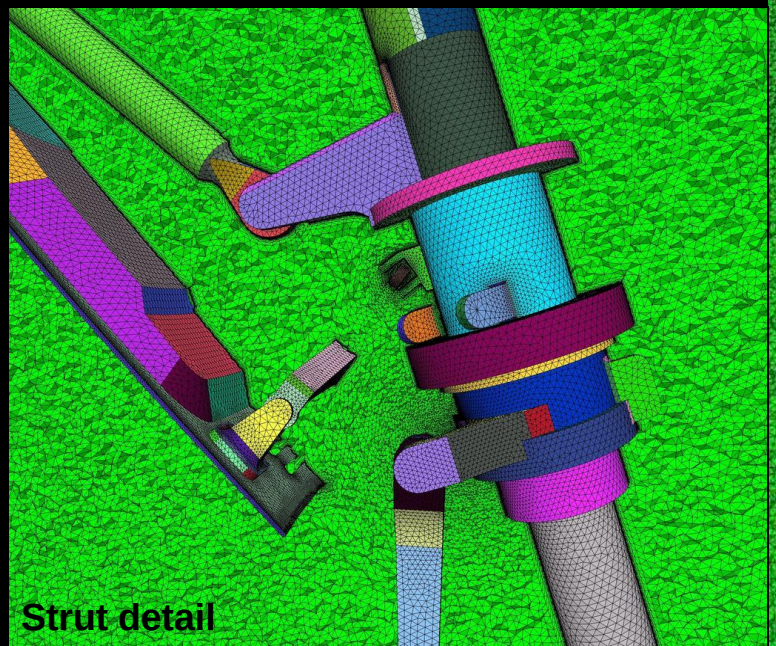
Unstructured



Airframe Noise Reduction – Geometry and Grid Generation Support

Gulfstream G5 Landing Gear Assembly

- Geometry simplified to facilitate gridding and analysis. High grid density required to support acoustic analysis.
- Unstructured grid contains ~140 million tetrahedra.

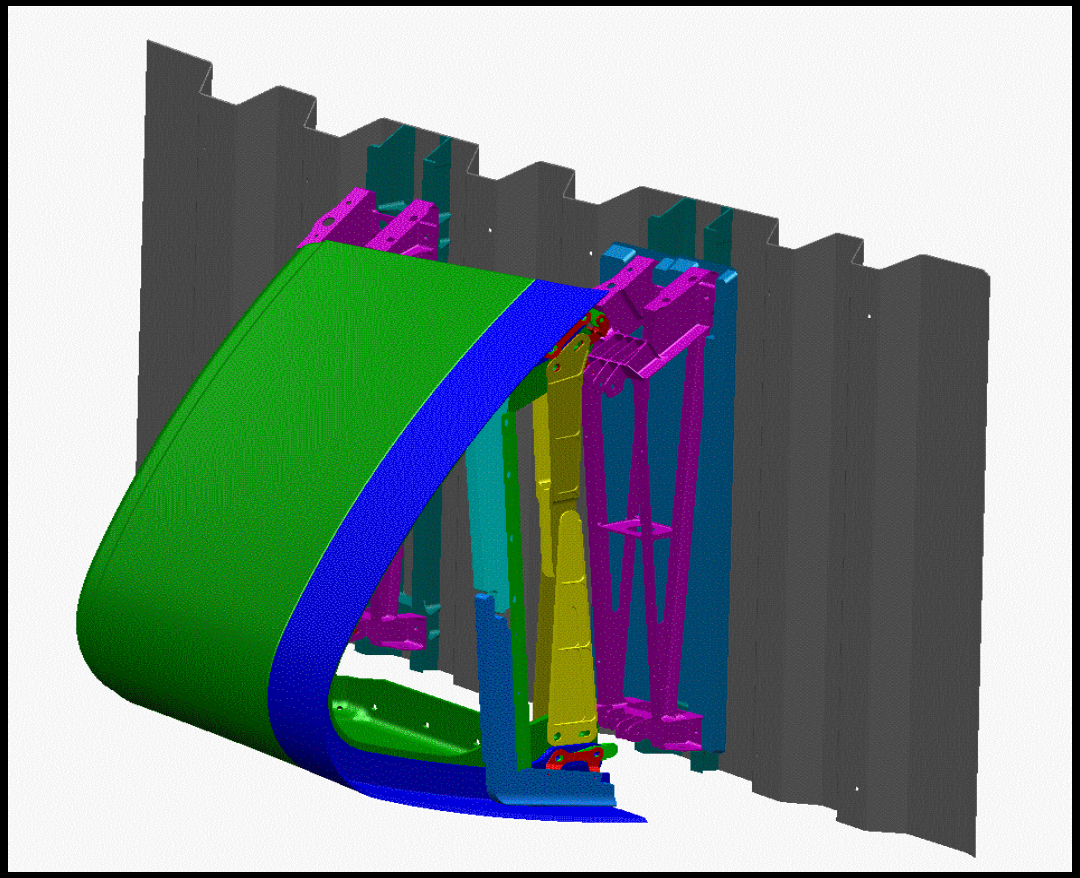


Strut detail

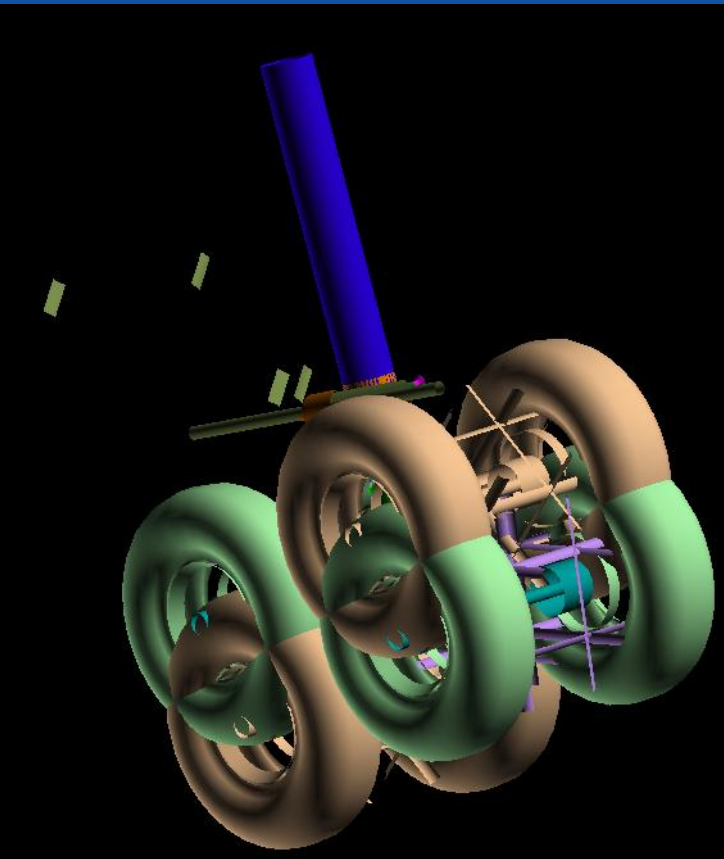
CAD Data Translation

Shuttle Return-To-Flight Wind Tunnel Model

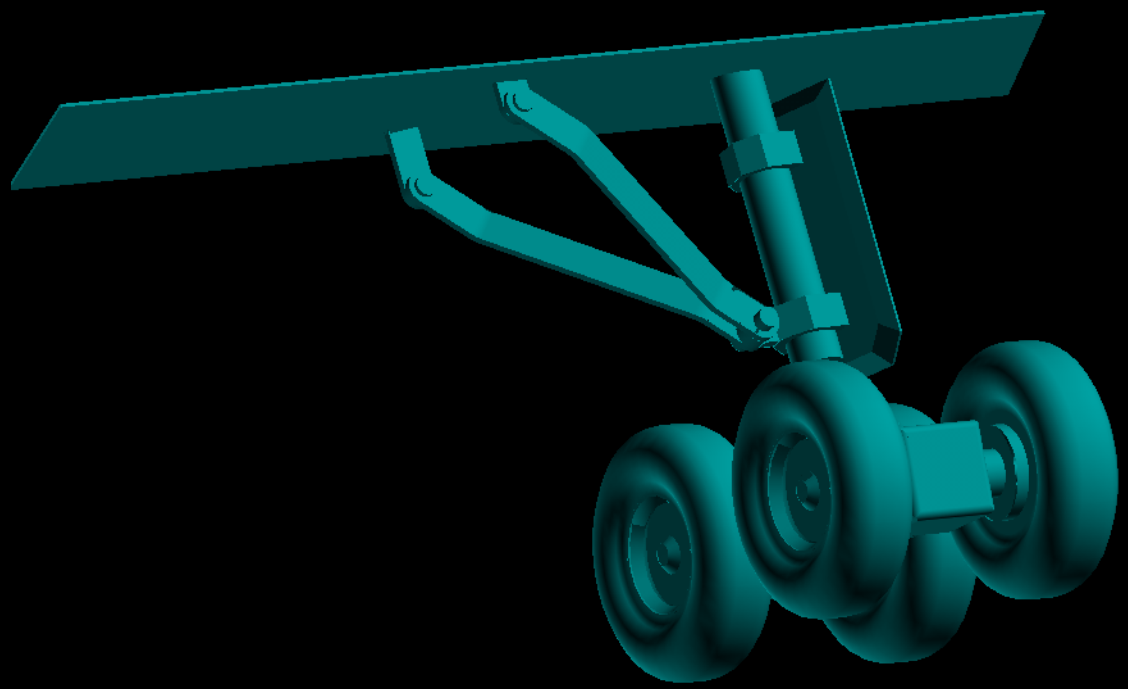
RCC Panel 6 and Mounting Hardware Geometry translated from CATIA V4 into Pro/Engineer for model fabrication



Landing Gear Data Extracted for Analysis



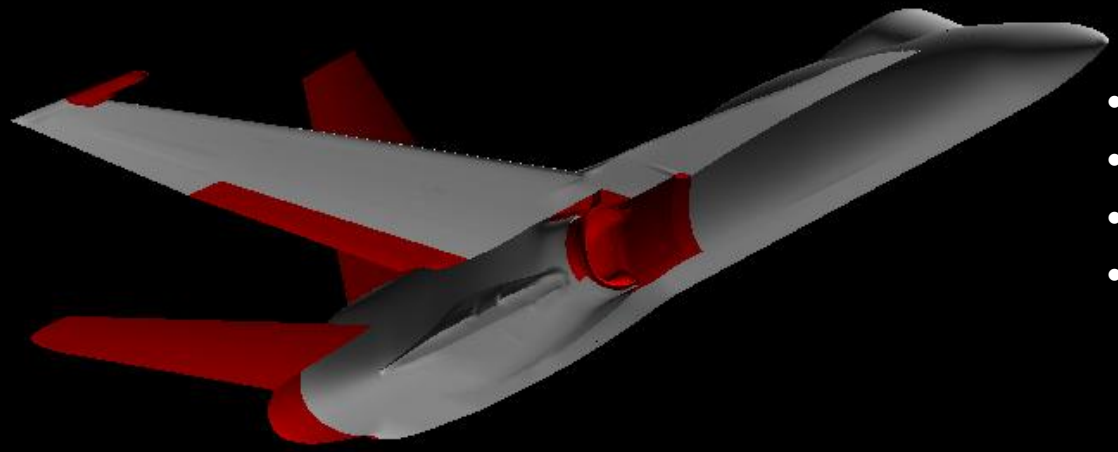
Data as received



Data after processing

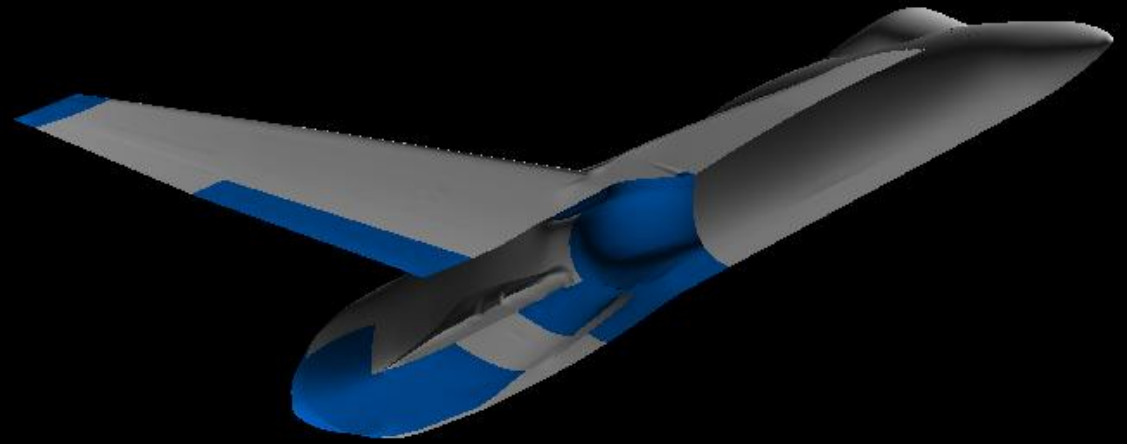
- Rotated geometry removed
- Bracket geometry rebuilt to match test article
- Axle blocks completed as solid entities

Geometry Changes to Facilitate Analysis



Original F18aaw

- Remove tail surfaces & missile
- Cover notch in trailing edge
- Cover inlet/diverter geometry
- Simplify & cap engine nozzle



Simplified F18aaw

Topology Simplification
Shuttle Return-To-Flight – RCC Panels

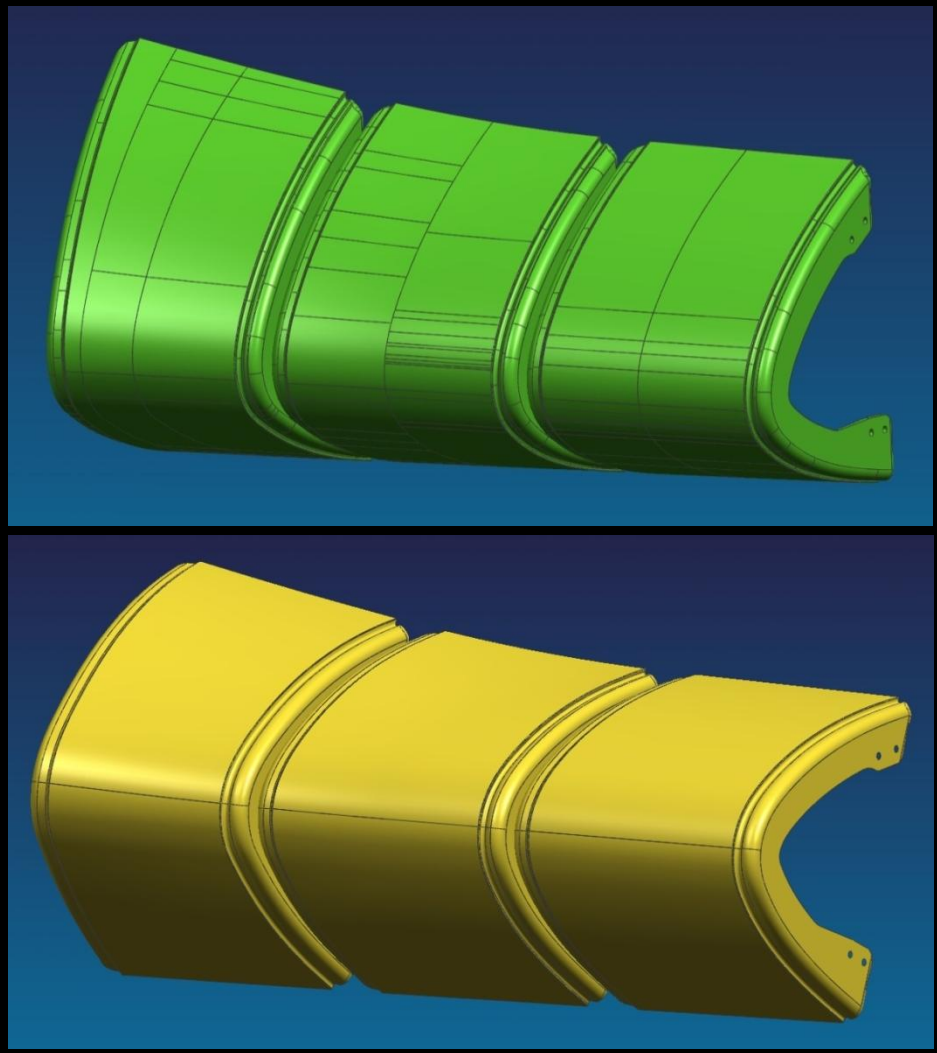
Certified Boeing Geometry of RCC Leading Edge Panels 8, 9, 10

~100 surfaces for panel OML ONLY

Simplified Geometry of RCC Leading Edge Panels 8, 9, 10

2 surfaces per panel OML

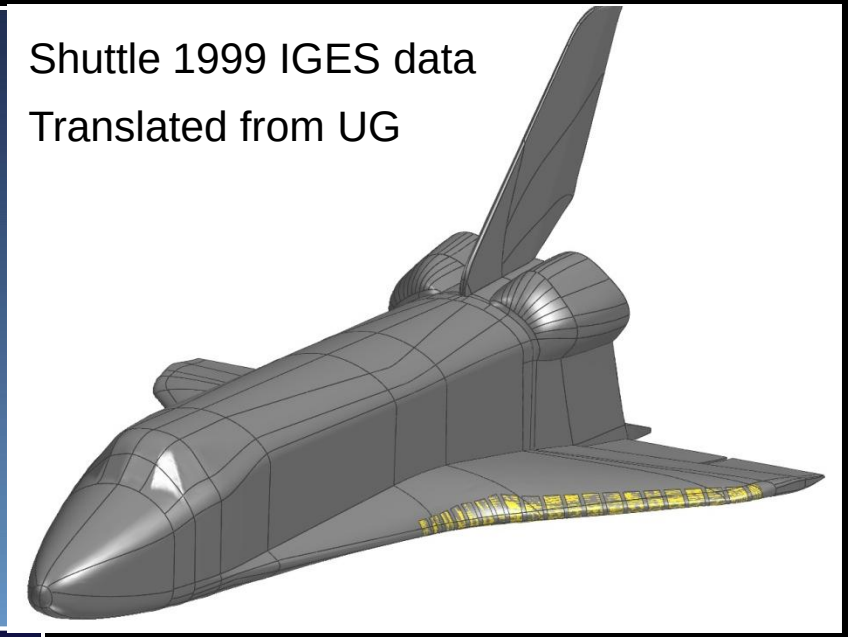
Within .001” of Certified Data

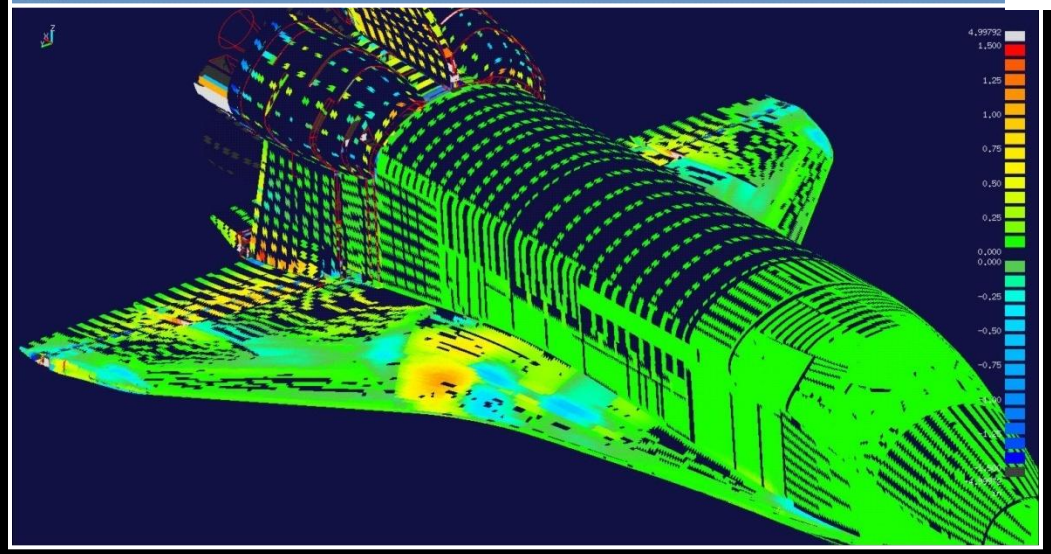


Cleaned Solid Models for Rapid Prototype Wind Tunnel Models and CAE analysis

Geometry Comparison & Verfication

Columbia Accident Geometry Data Recovery

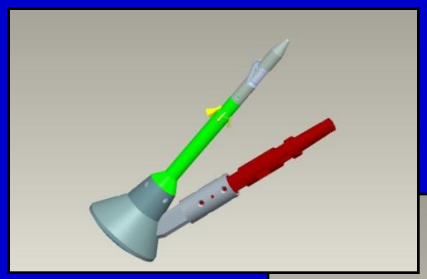


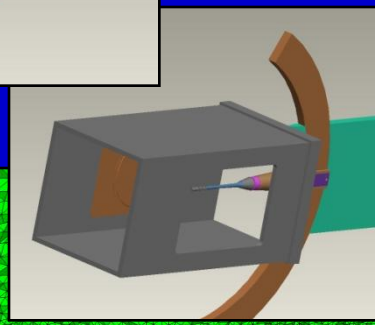


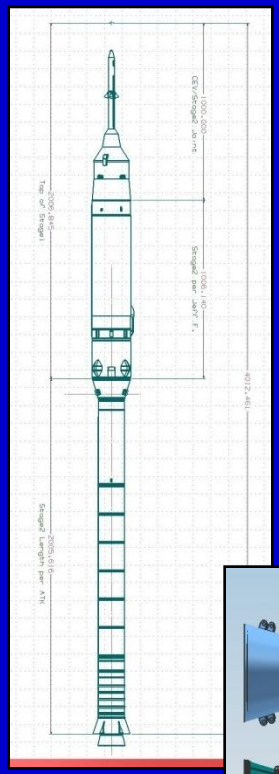
Comparison of Shuttle 2002 to Shuttle1999 geometry found differences on upper wing surfaces, oms pods, and rocket motors.

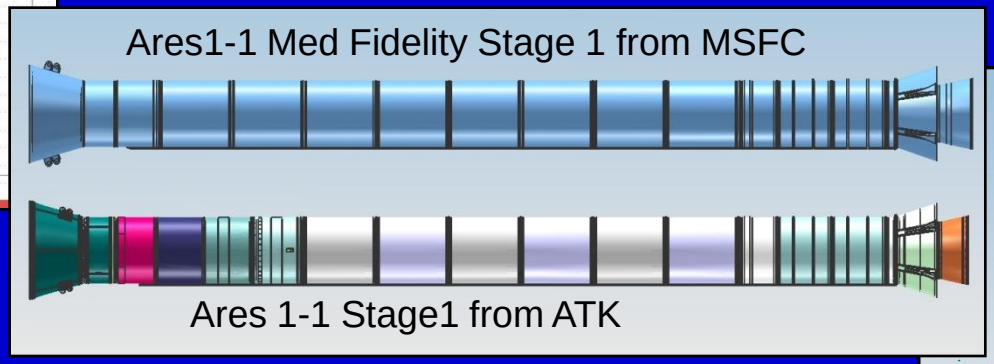
Geolab Support Tasks for ARES

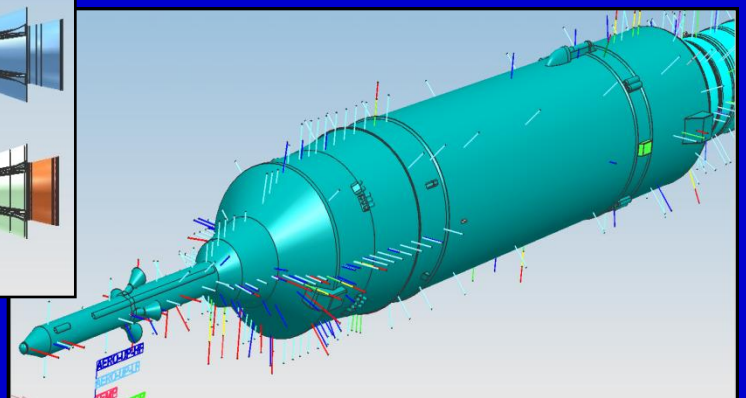
- Geometry OML/EDF baseline drawings
- Geometry comparisons
- Instrumentation reduction images
- Geometry modeling & unstructured grids for analysis supporting aero database and aeroelasticity loads calculations
  - ALAS/605 capsule with covers and stings
  - MLAS covers
  - Ares I
  - Ares I-X
  - Ares V







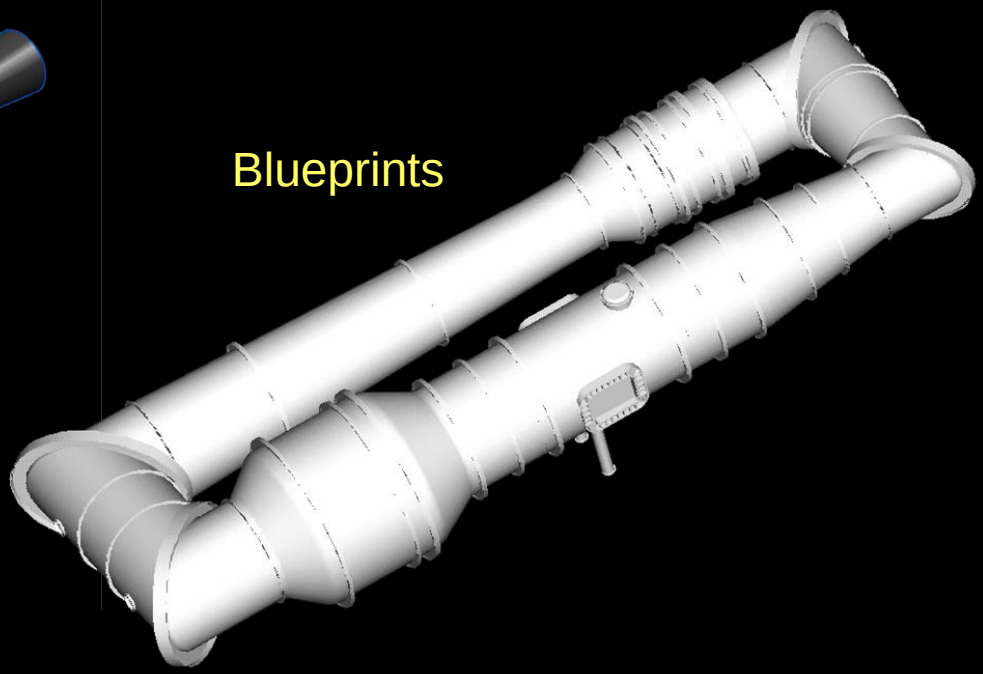




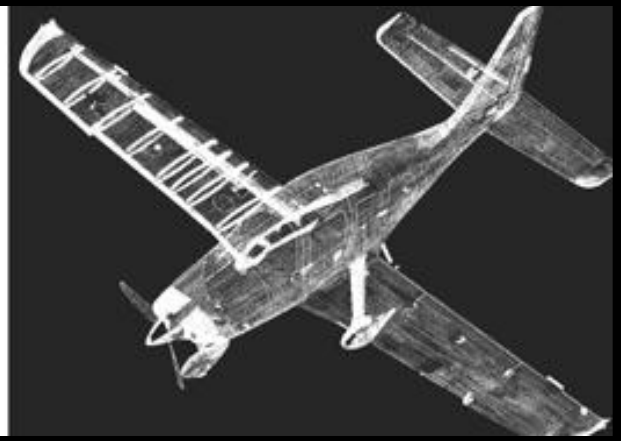
Geometry Reconstruction

Tabulated Data &
Analytic Data

Blueprints



Digital Measurements



Geometry Reconstruction

Technology Objective

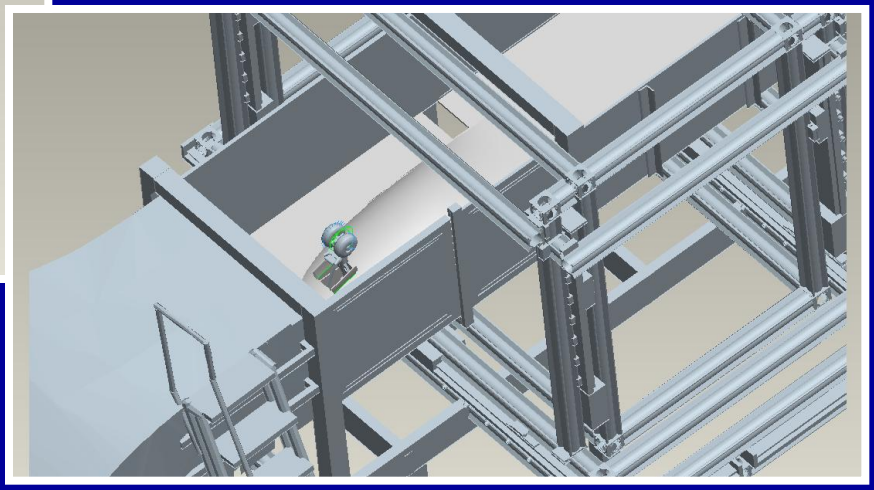
- Reverse engineer CAD geometry using photographs and design specifications obtained thru web sites for Boeing 777 nose landing gear.

Application of Technology

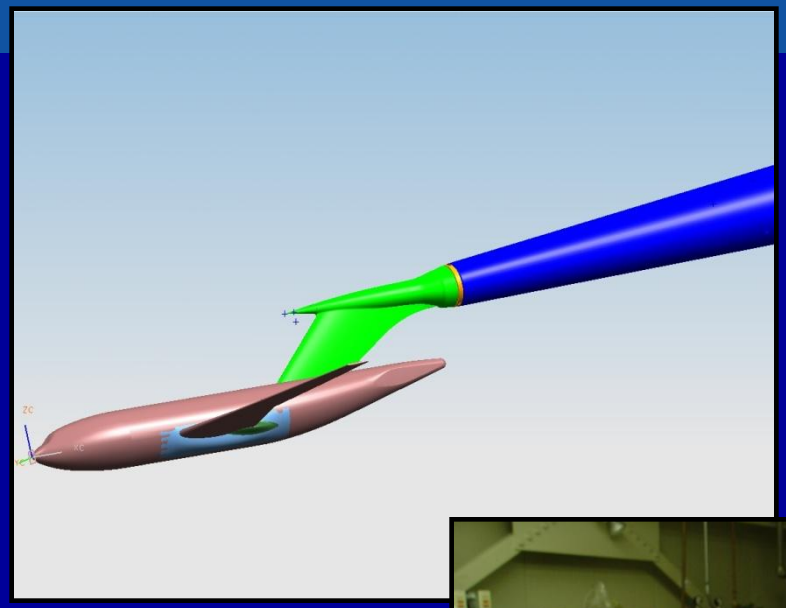
- Utilization of the Style module in the Pro/Engineer CAD software to extract 3D design data from Boeing reference photographs.

Significant Accomplishments

- Created 11% CAD model to support CFD analysis, model fabrication, and experiment design in BART and QFF tunnels for follow-on research.

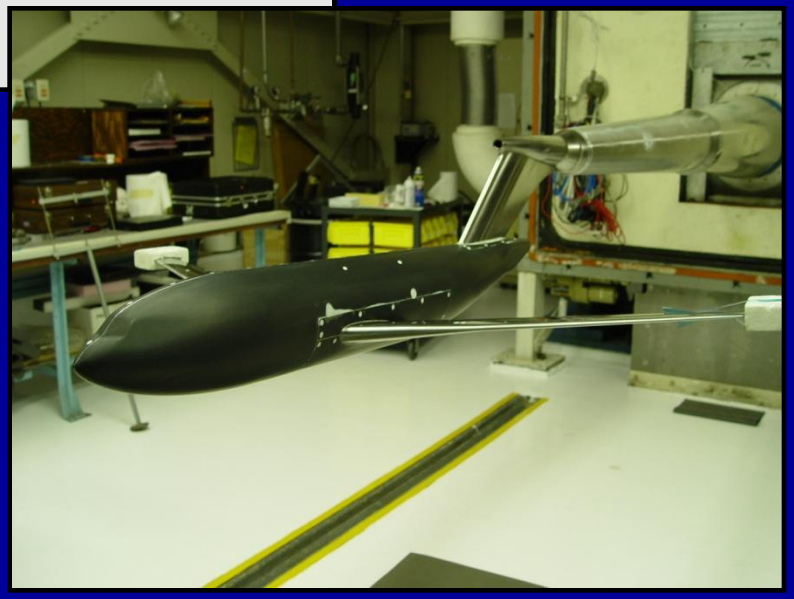


Drag Prediction Workshop Model Surface Reconstruction



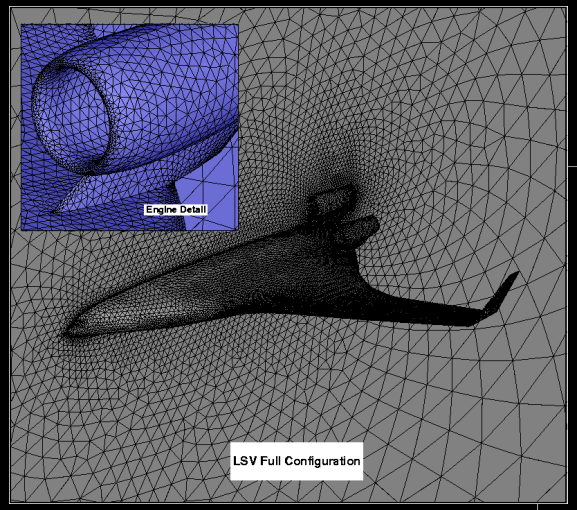
Wing fairing surfaces reconstructed from digital measurements acquired by QA and incorporated into existing CAD model by GEOLAB.

Fuselage, wing, & sting surfaces in CAD model updated to reflect as-built geometry. Unstructured grid will be generated to support analyses being run for CFD code validation.



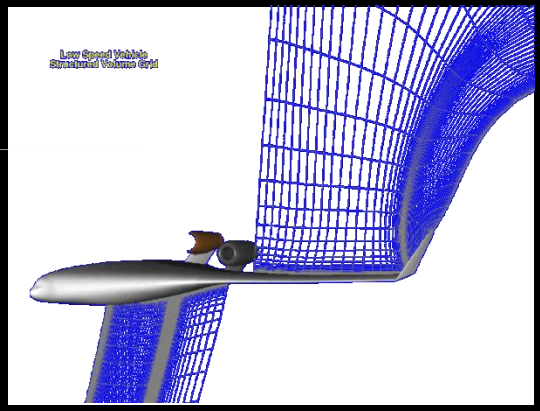
DLR-F6 CAD & wind tunnel models

Geometry Management

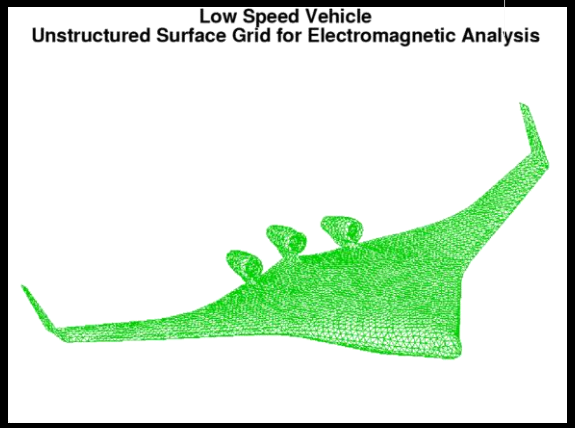


Aerodynamics

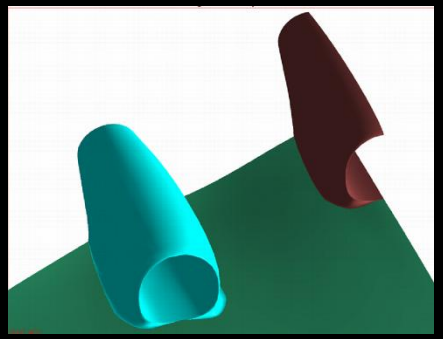
Low Speed Vehicle
(LSV)

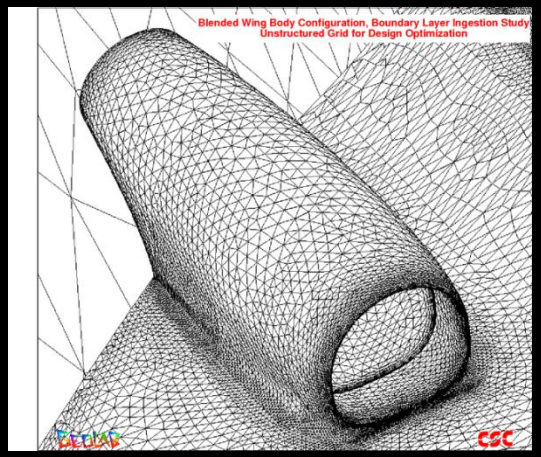


Multidisciplinary Optimization



Electromagnetics





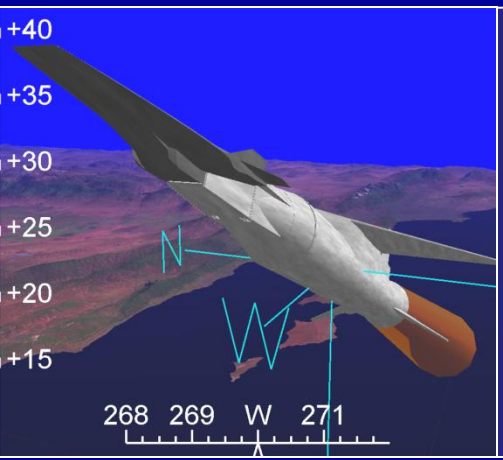
Boundary Layer Ingestion Design Study

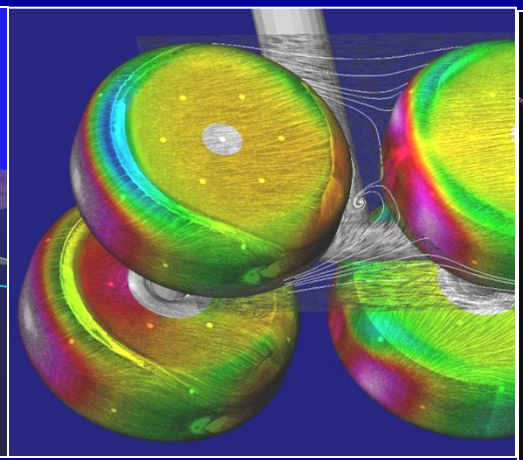
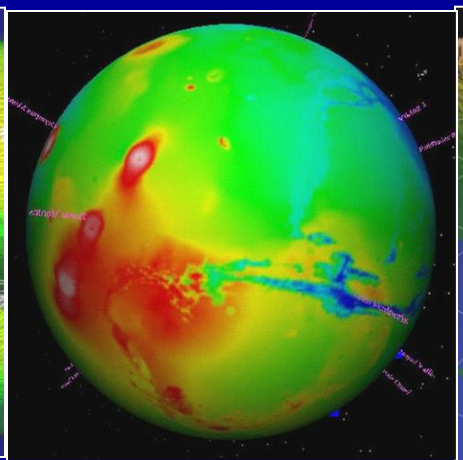
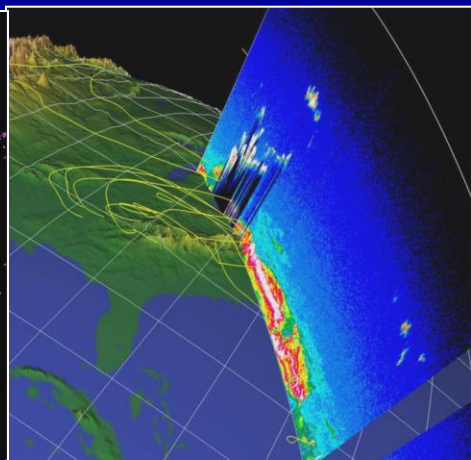
GEOLAB Summary

- Maintain proficiency in CAD, grid generation, geometry data exchange
- Facilitate communication between design/analysis & manufacturing to link research data and hardware
- Provide project teams in geometry verification and data distribution services
- Leverage common elements between researchers' requests to minimize duplication of effort and promote reuse of previously generated grids and geometry models

Data Visualization and Analysis Lab (DVAL)

- Real Time Flight Visualization
- Wind Tunnel Data Fusion
- Photogrammetric Scene Reconstruction
- Collaborative Immersive Environments
- Mission Planning & Analysis Tools
- Satellite Data Visualization



Data Visualization and Analysis

- Open shop laboratory in B1268, RM 1051
- 7 linux and windows high end PC and Mac pro workstations, and a Fakespace Work Wall with haptic devices for human/computer interaction.
- Trained staff available to partner with the research community on specific visualization applications**.**
- Tasks of moderate duration – weeks to months
- Approximately 10 major projects/year

Data Analysis and Visualization Software Inventory

Visualization software:

- Fieldview, Ensight, Tecplot, Matlab
- Satellite Toolkit, Kitware VTK
- OpenSceneGraph
- 3D Studio, Softimage, Maya, Final Cut Pro

Collaborative software:

- Cavelib

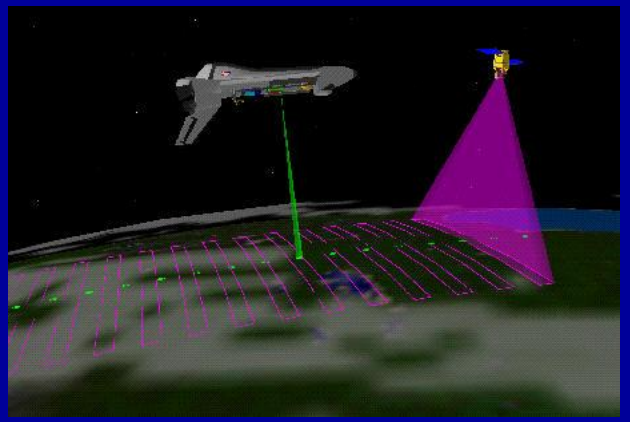
Programming software:

- Microsoft Visual C++, Gnu C++ compilers
- Mac Xcode Development Environment

Data Visualization & Analysis Lab

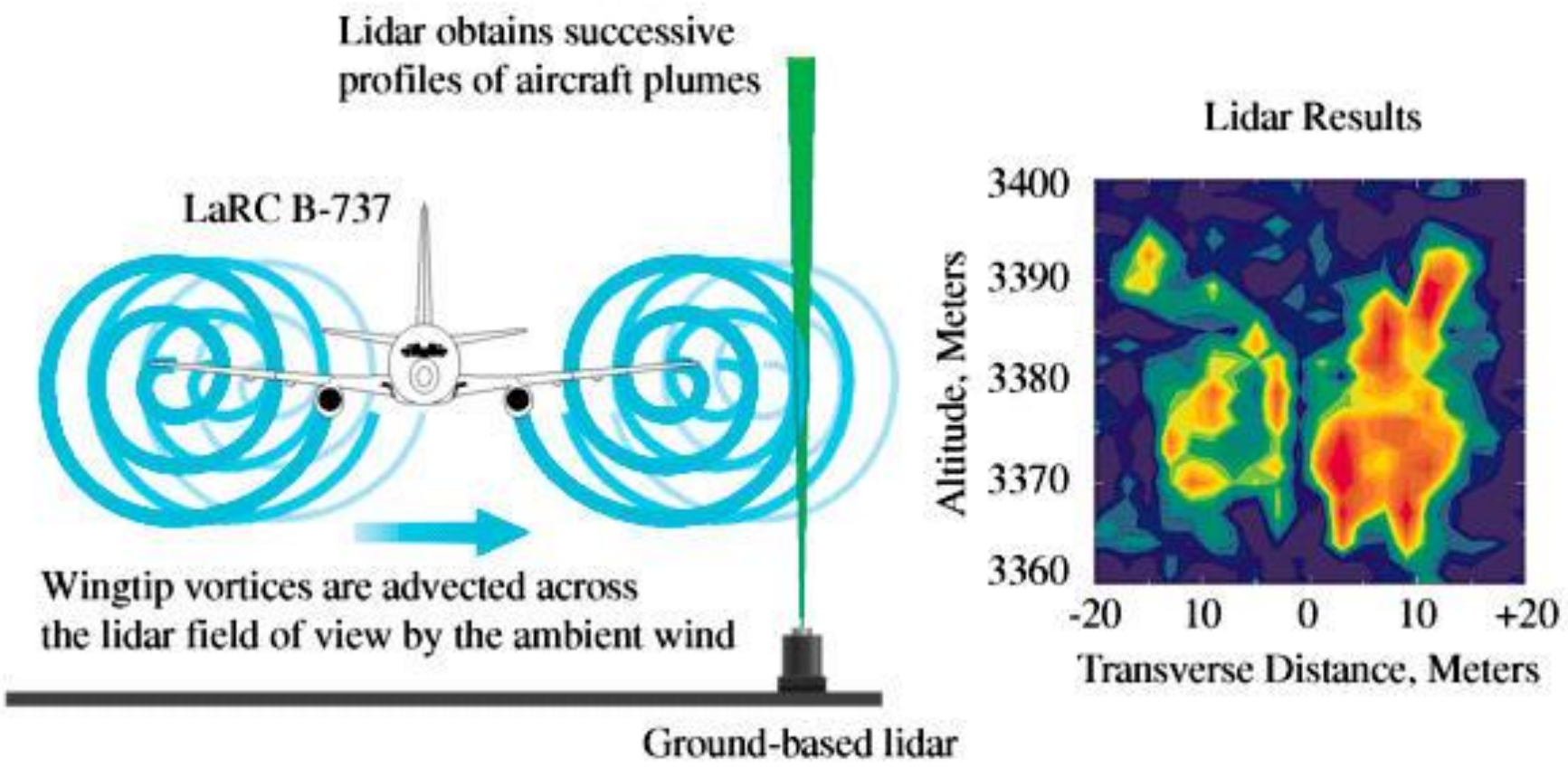
Application Areas and Projects

- Computational Fluid Dynamics
- Wind Tunnel Fluid Dynamics
- Remote Sensing
- Atmospheric modeling and simulation
- Satellite / Sensor Mission Planning
  - Clarreo, Calipso, CEOS, ALHAT
- Data/photo cataloging
- Airborne atmospheric sensor visualization
- Radiation shielding visualization
- Aircraft fly-over simulation
- Support of accident investigations
  - HyperX and Shuttle

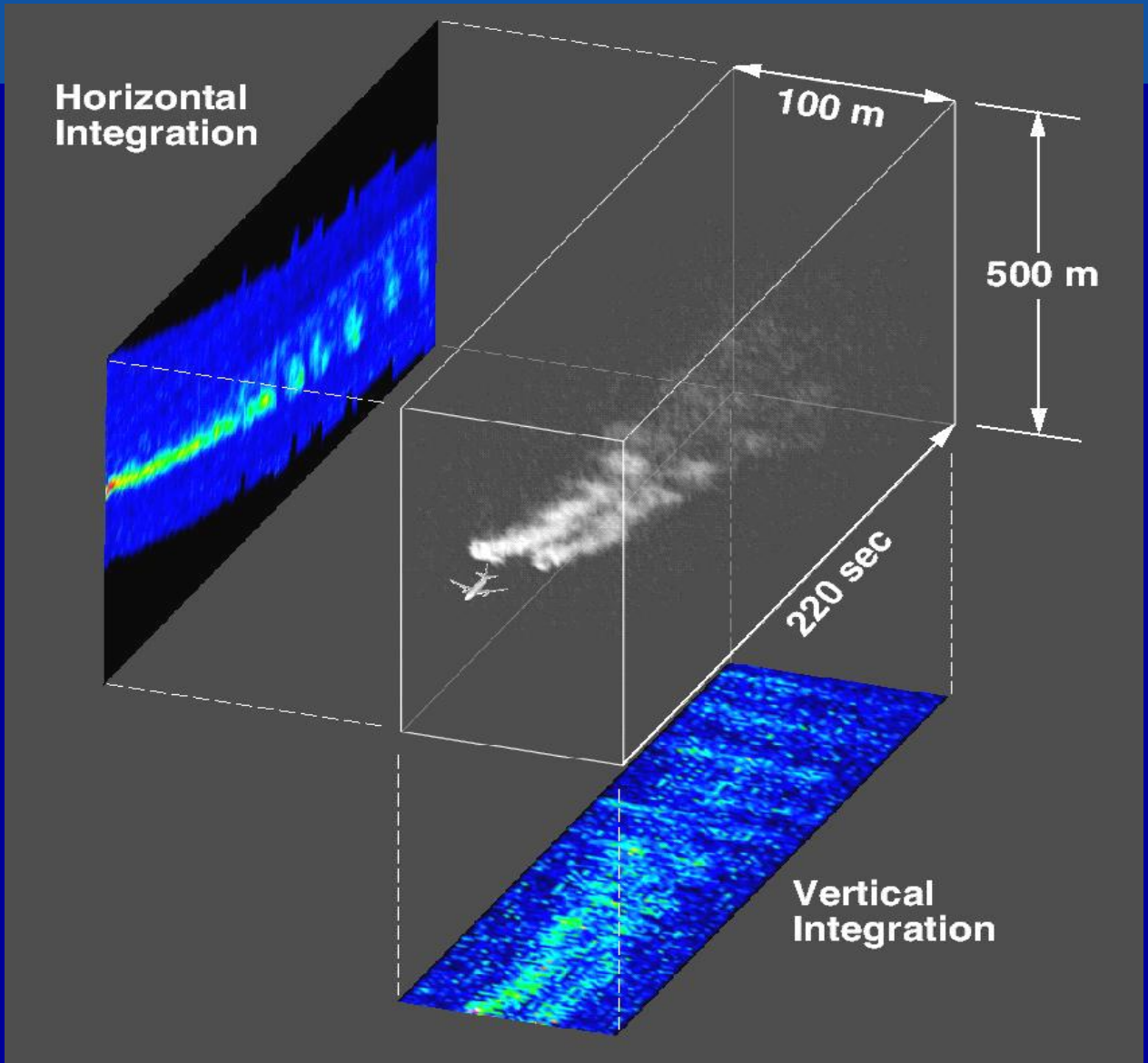


LIDAR mission planning

Atmospheric Data Visualization



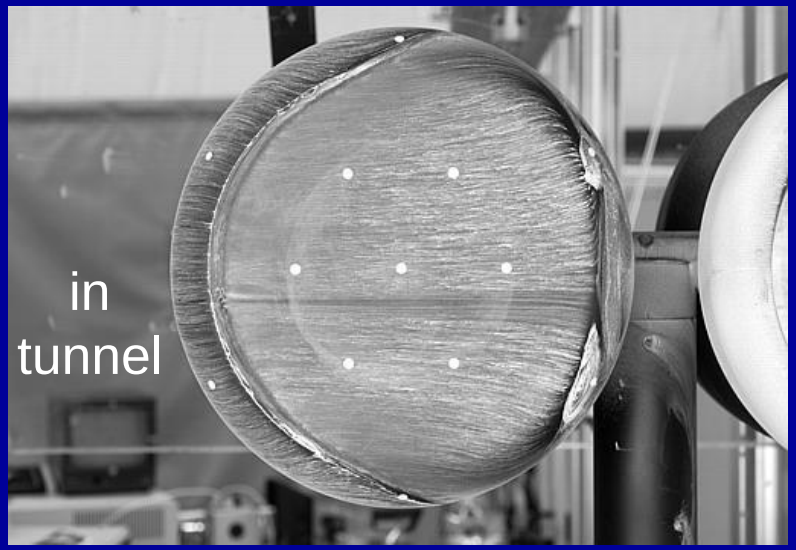
3-D Wake Visualization

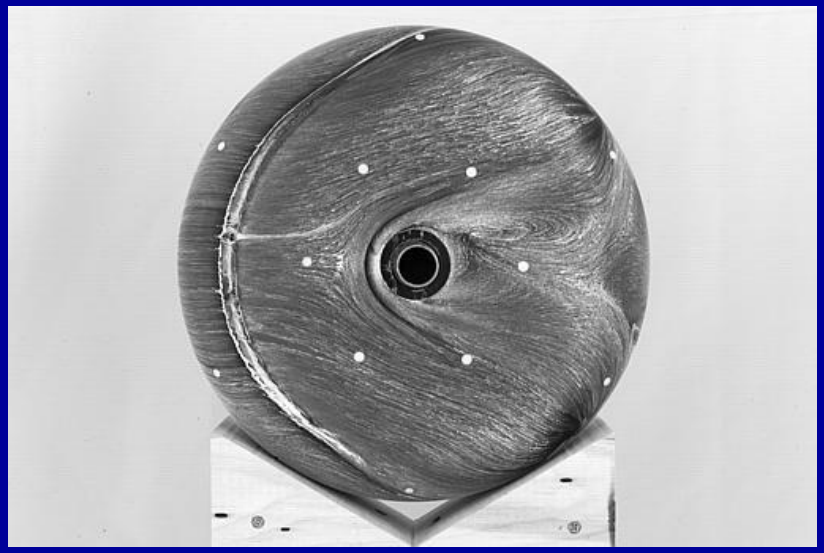


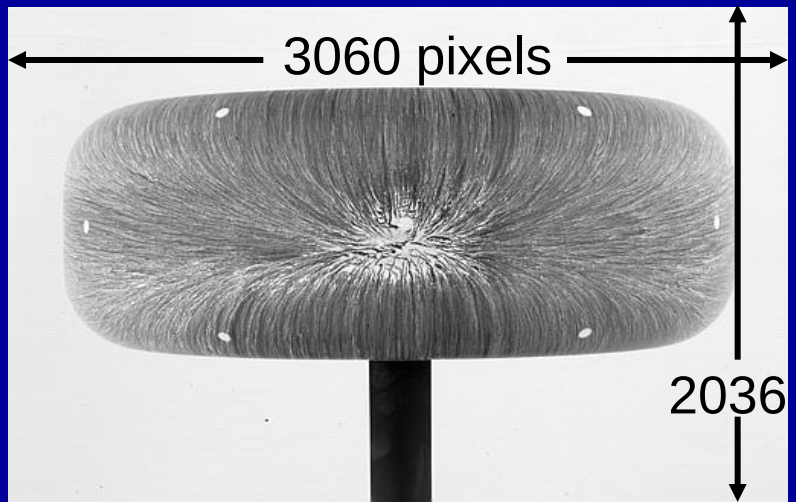
Data Fusion Example: Landing Gear Flow Visualization

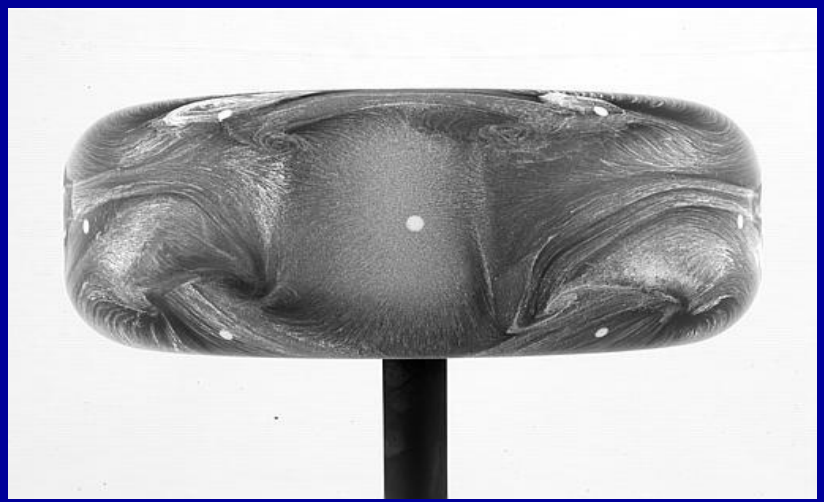
Landing Gear Model in the Langley Basic Aerodynamics Research Tunnel

Sample Oil Flow Images from the Wind Tunnel

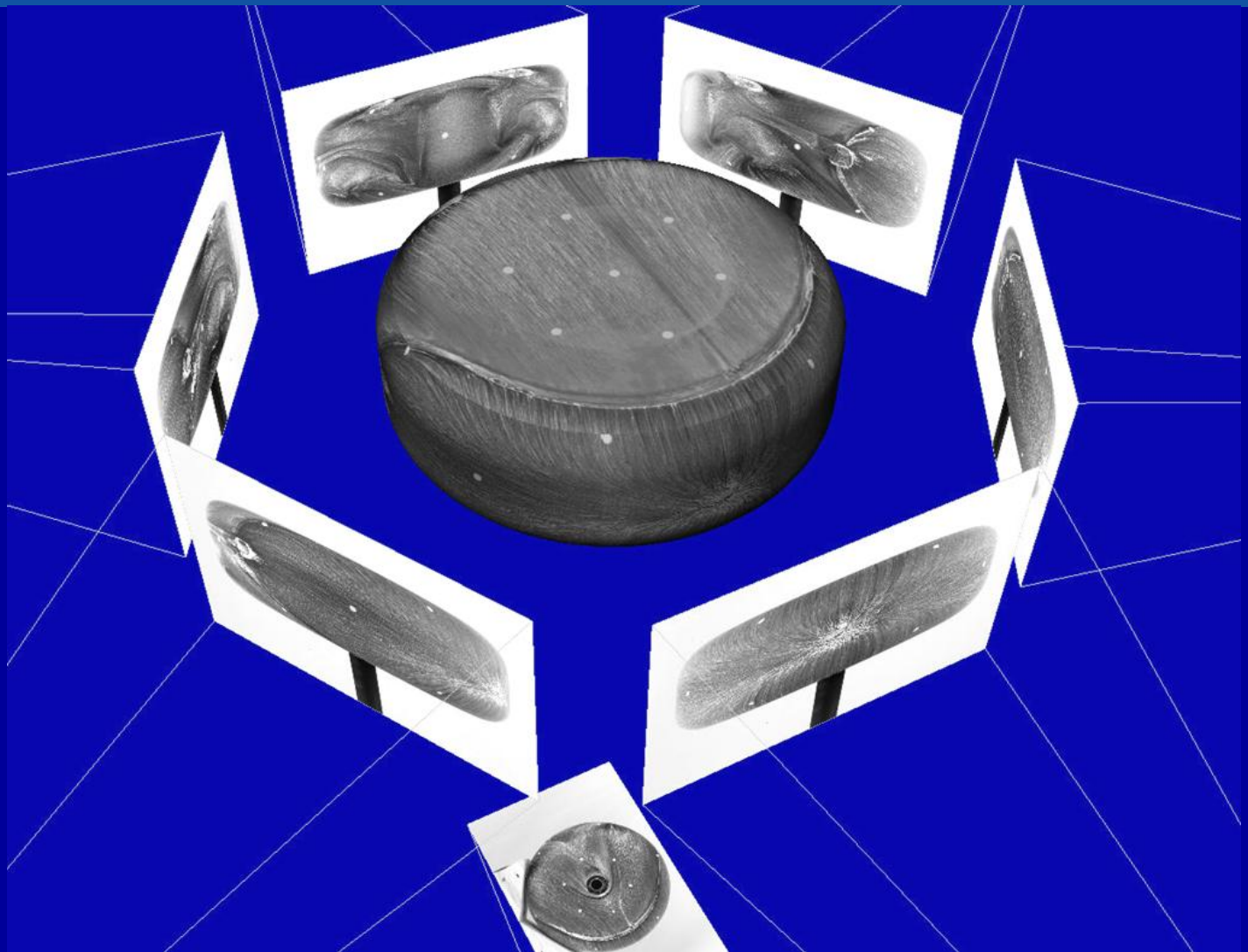




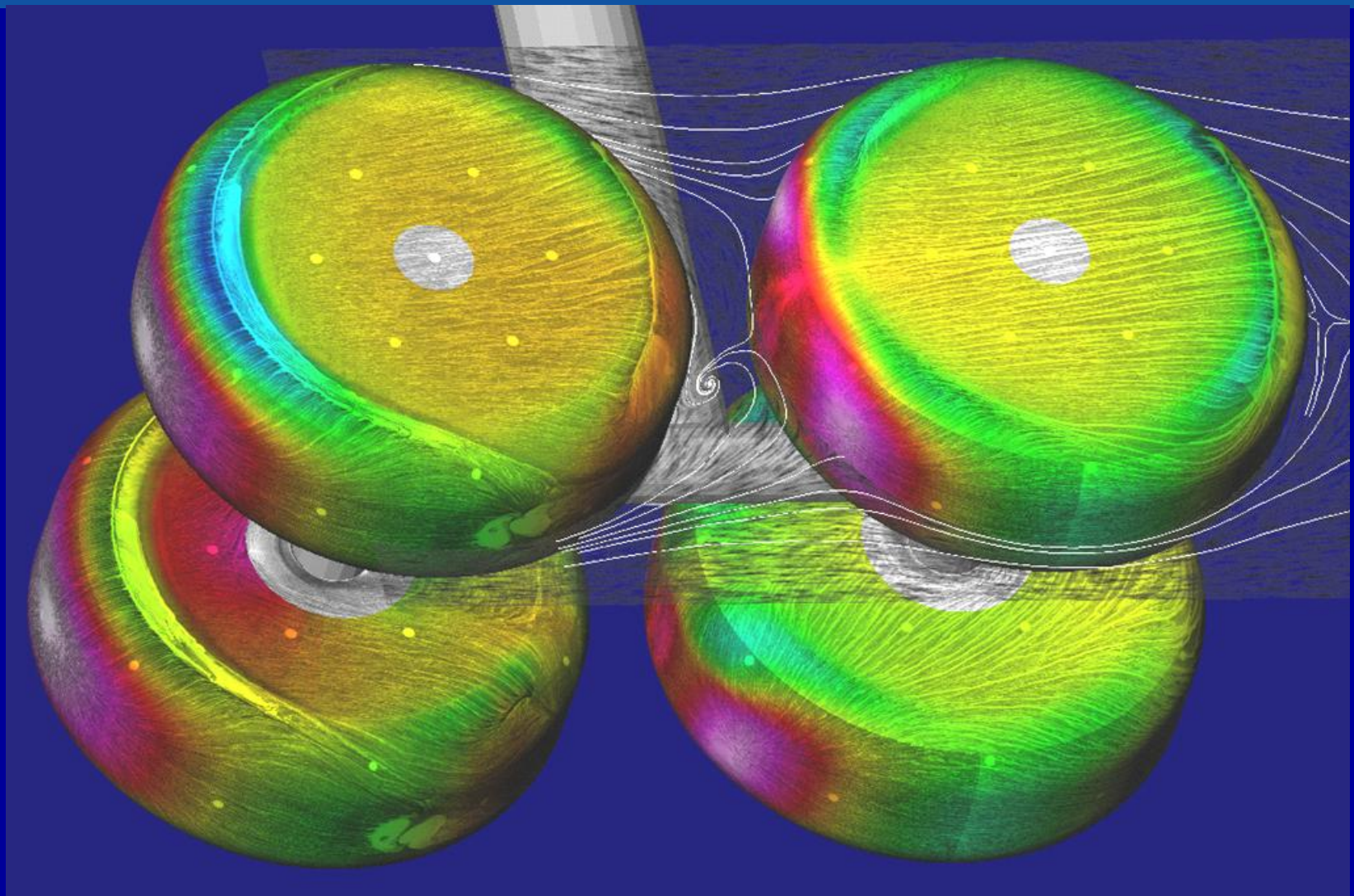




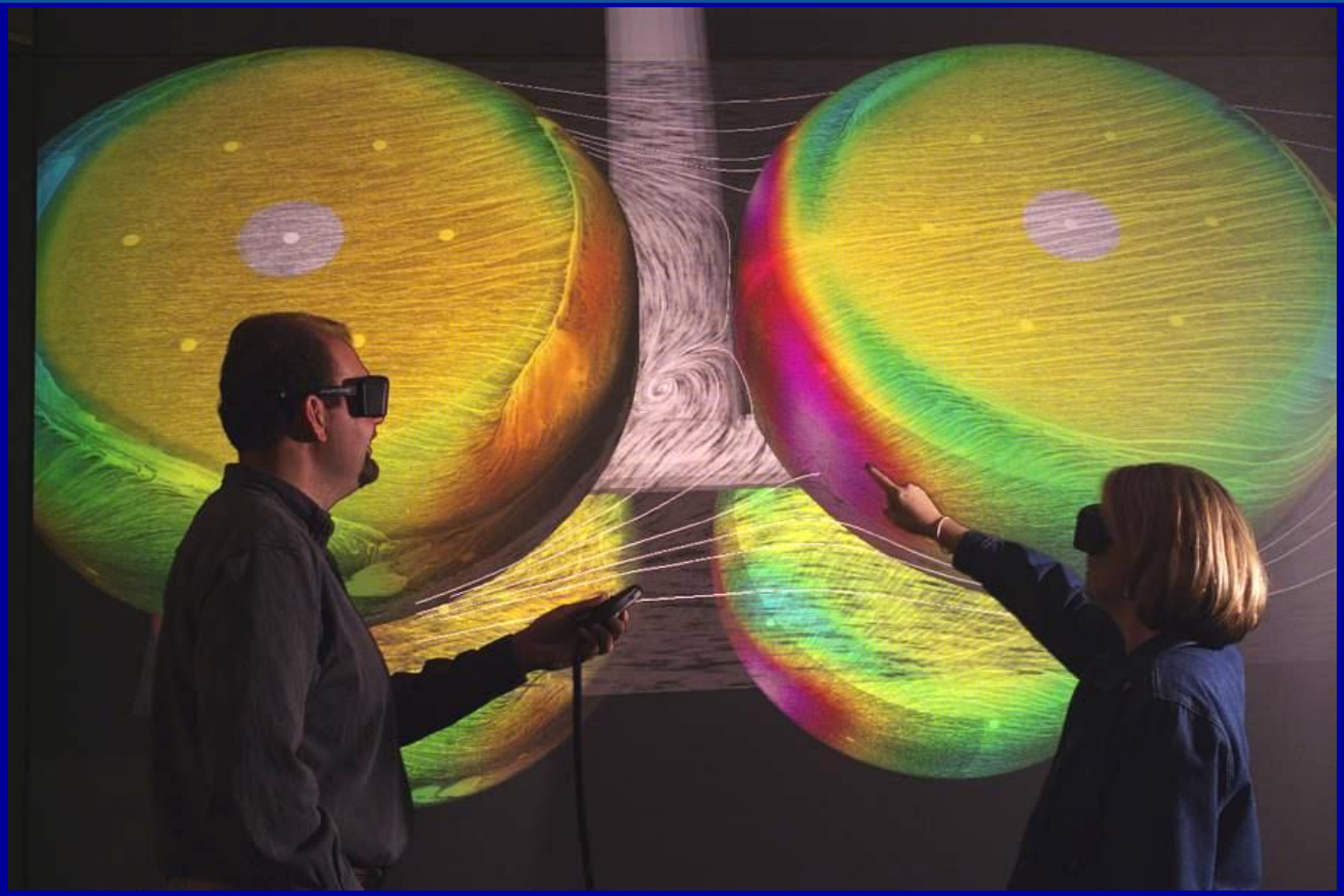
3-D Reconstruction from Multiple Camera Views



Data Fusion of Image, Scalar, and Vector Fields



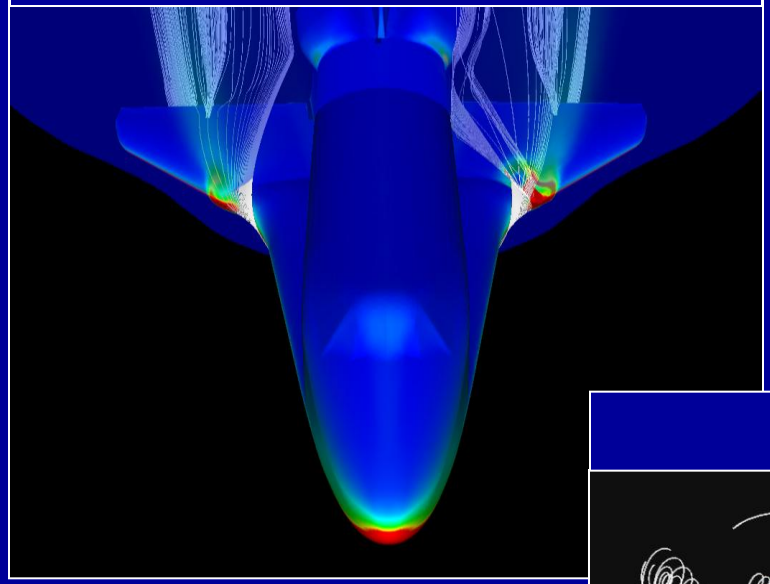
Immersive Display of Landing Gear Visualization



8’x6’ 1280x1024 Digital Immersive Workwall, Fakespace Systems

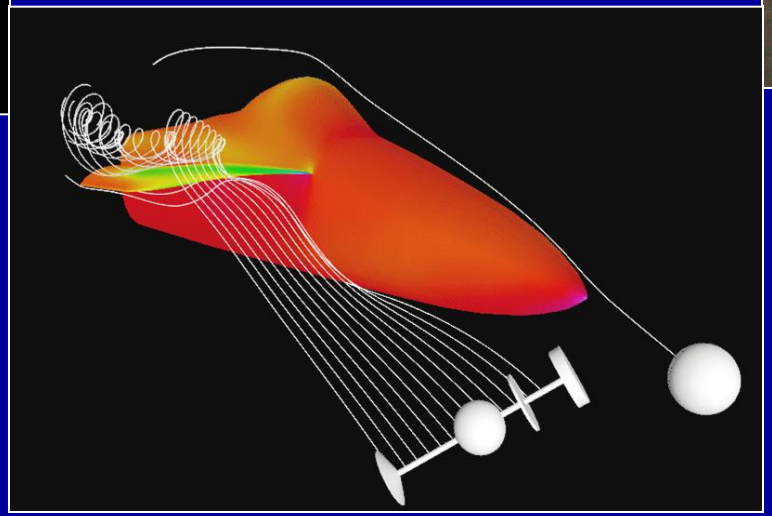
Collaborative / Immersive Virtual Environments

visualization of damaged Shuttle



Radiation field simulation of the International Space Station interior

virtual wind tunnel



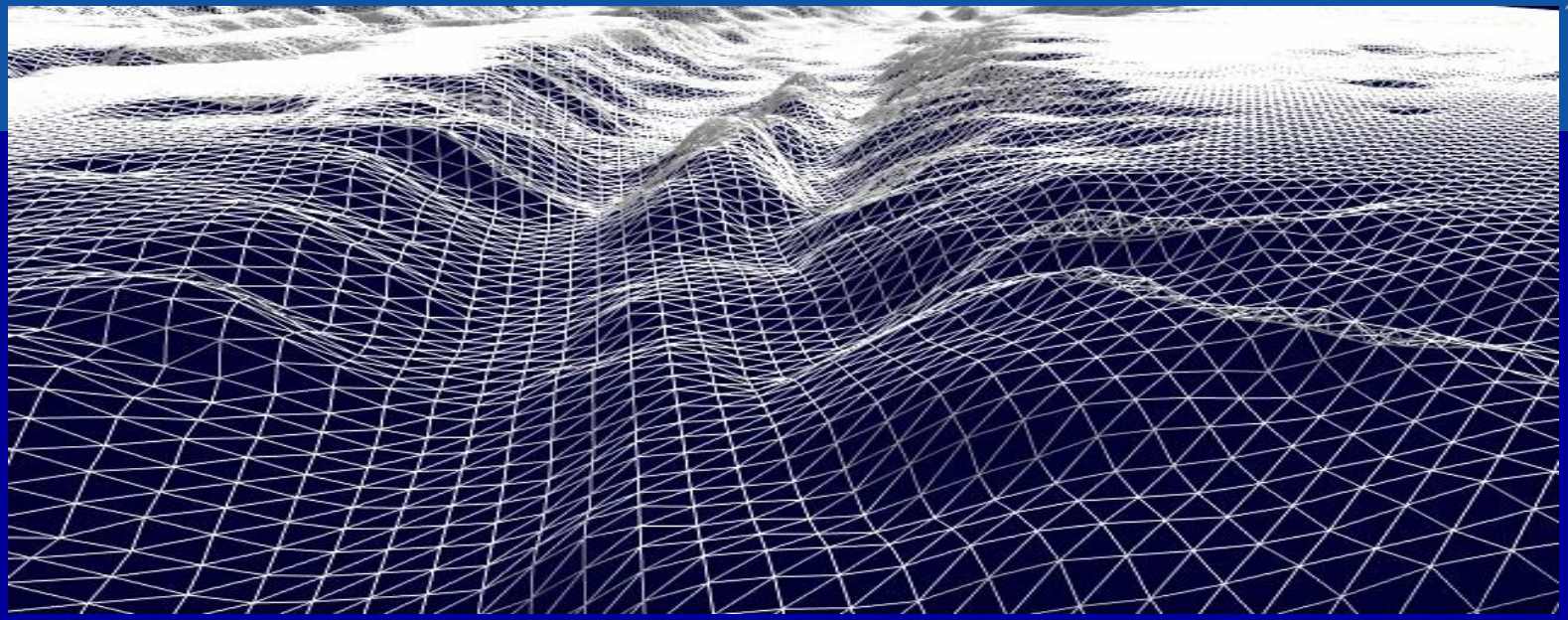
LaRC Facilities:

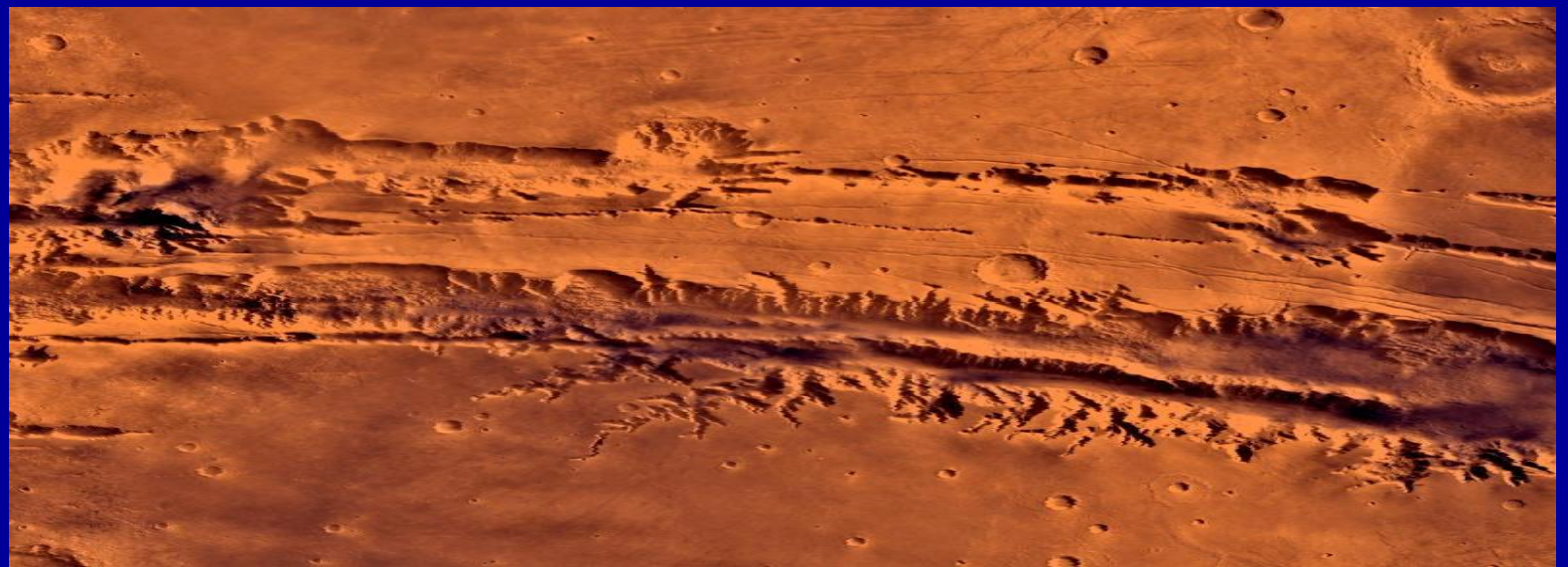
- CAVE Room
- Digital WorkWall
- Immersadesk

LaRC Software:

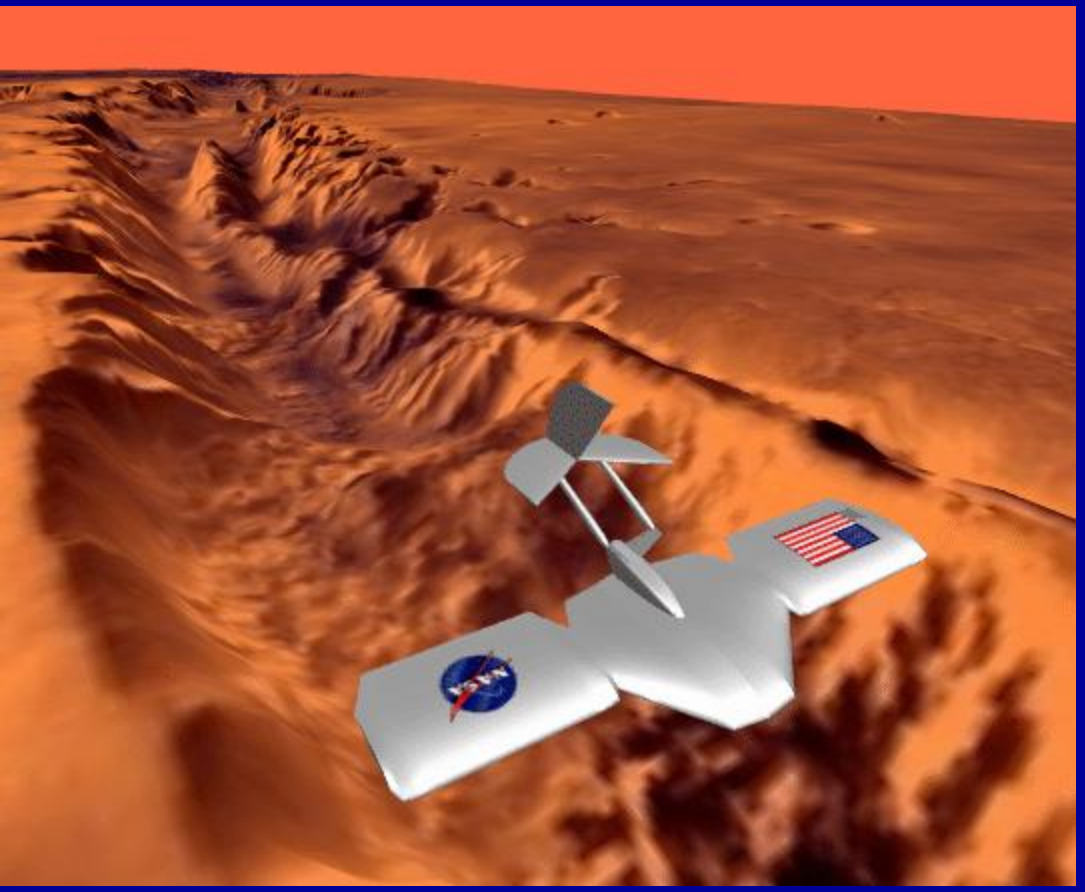
- CAVElib
- Ensight
- Custom-built

Terrain Visualization

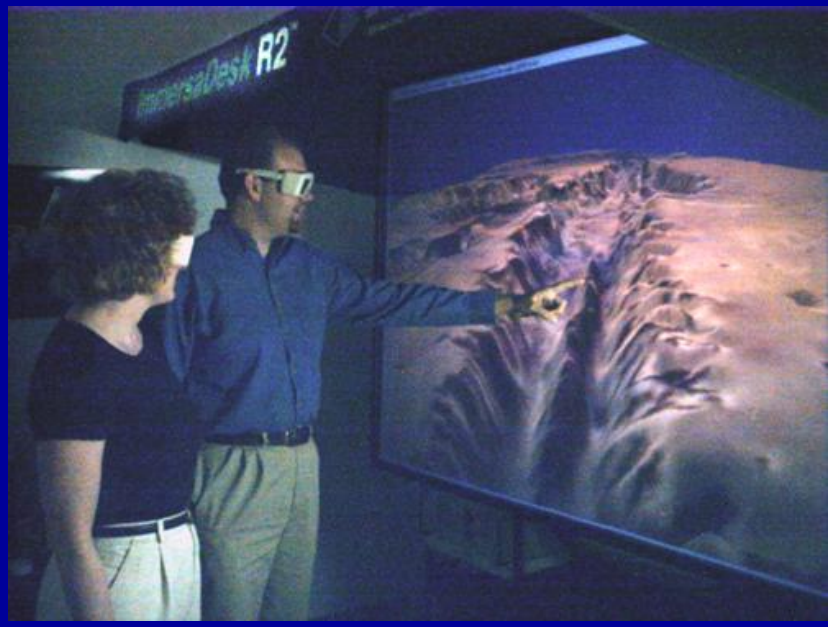




Immersive Mission Planning



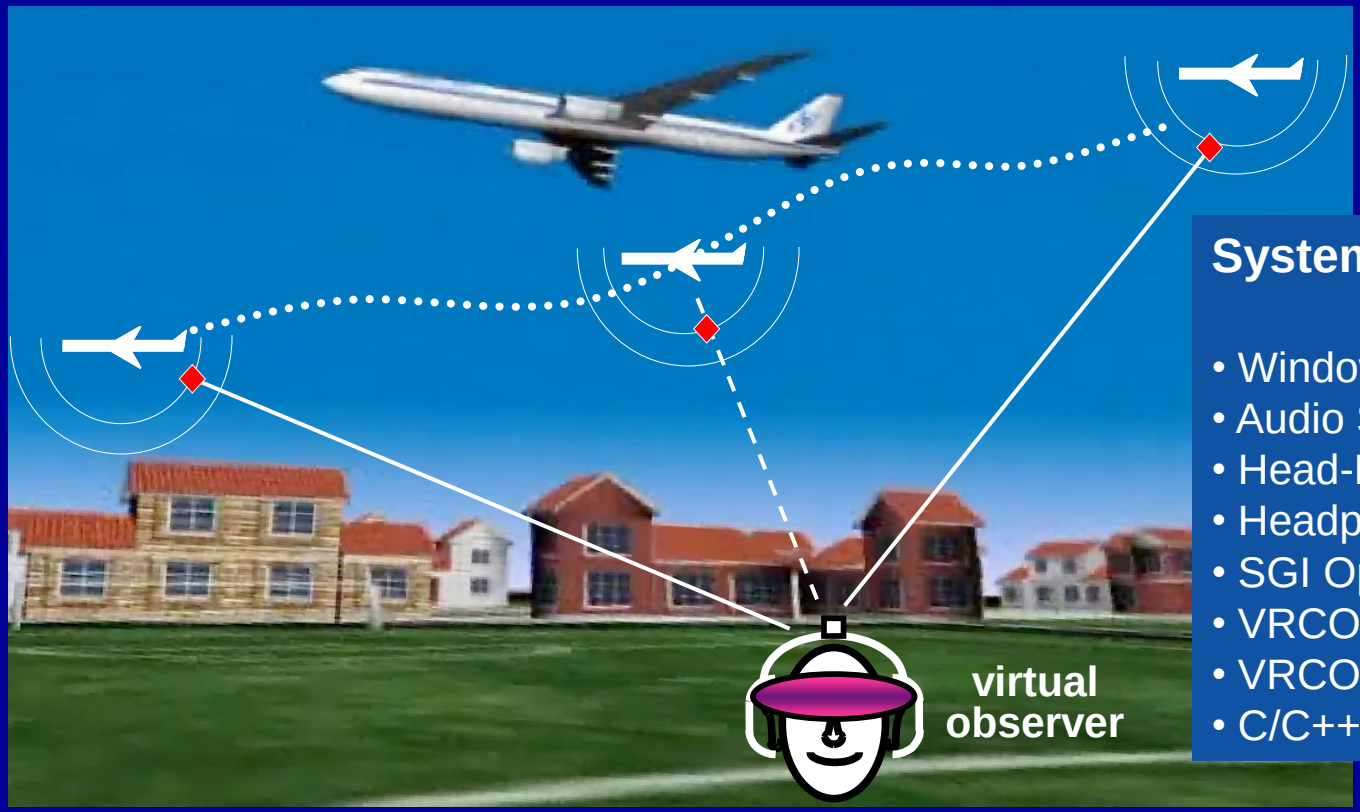
Mars Airplane Concept



Immersadesk display

Community Noise Test Environment and Aircraft Source Noise Generator

An immersive acoustic-visual environment for presenting both synthesized and recorded aircraft flyover noise to a virtual listener on the ground, for use in subjective testing environments. Directional sound is synthesized by modeling multiple point sources of aircraft noise (left/right engines, forward/aft fans, landing gear, flaps, etc.)



System Components:

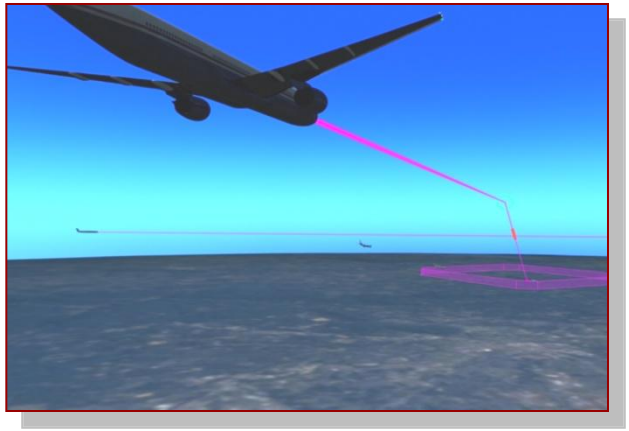
- Windows PC, or Linux/IRIX
- Audio Server (AuSIM)
- Head-Mounted Display
- Headphones/Speakers
- SGI OpenGL Performer
- VRCO CAVELib software
- VRCO tracking software
- C/C++ simulation application

LITES

Airspace and Traffic Operations Simulation (ATOS) and the Air Traffic Operations Laboratory (ATOL)

Brian L. Bixler

Research and Technology Directorate



Airspace and Traffic Operations Simulation (ATOS) and the *Air Traffic Operations Laboratory (ATOL)*

Brian Bixler
Crew Systems & Aviation Operations Branch
NASA Langley Research Center

November 09, 2009

Overview

- **Background**
- **Description of Air Traffic Operations Lab (ATOL)**
- **Description of Airspace and Traffic Operations Simulation (ATOS)**
- **ATOS Build Development and Testing**
- **Multi-Domain Nature of the Task**

Background

- **Research Goal**: ***Increase the capacity and safety of the U.S. air transportation system to meet expected increases in demand***

- **Specific Areas of Research Using ATOL/ATOS**:

  – ***Airborne Trajectory Management in En-Route Airspace***

    - ***Safety and Performance Characterization***
    - ***Trajectory Prediction Uncertainty***
    - ***4D Trajectory Concepts***

  – ***Airborne Precision Spacing in Terminal Airspace***

  – ***Automatic Dependent Surveillance-Broadcast (ADS-B)***

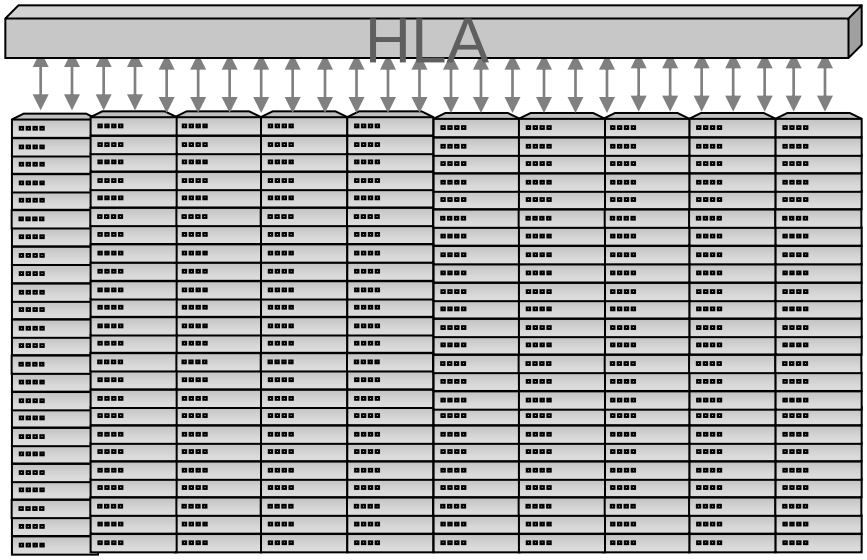
Background

- **Contractor Tasks**
  - Explore new methodologies for the development and enhancement of distributed airborne simulation tools
  - Design and develop new engineering models of revolutionary and enabling airborne technologies
  - Integrate these new simulation tools and engineering models into the Airspace and Traffic Operations Simulation (ATOS)
  - Aid in the conduct of simulations (including experiment design, data analysis, and reporting)
  - Support day-to-day Air Traffic Operations Lab (ATOL) operations

Air Traffic Operations Lab (ATOL)

Displays for Aircraft Simulation for Traffic Operations Research

A view of the Air Traffic Operations Laboratory



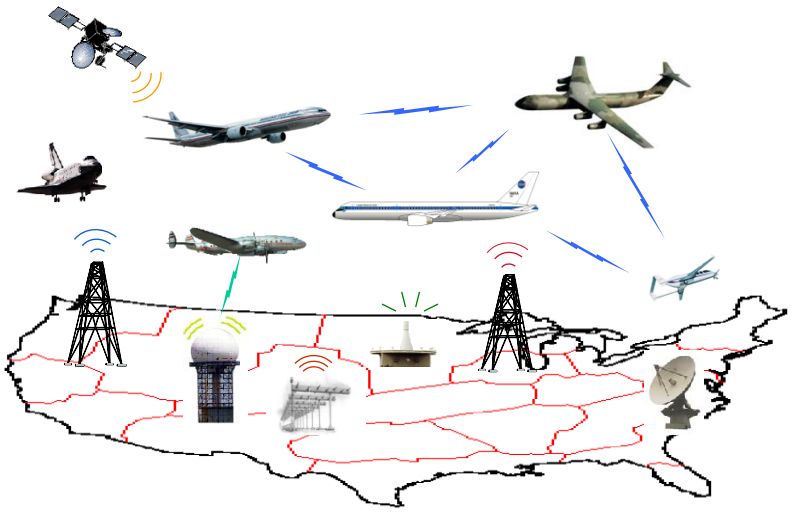
The Airspace & Traffic Operations Batch Simulation Platform

- **Network of computing platforms, each simulating an individual aircraft**
- **Over 300 platforms to include HITL "strings"**
- **Highly scalable**
- **(4) ACRS- ASTOR Crew Research Stations**

Other Things That Comprise ATOL

- **Pilot Room with Pilot Stations (several with flight controls and OTW visuals- including ACRS)**
- **ATOL/ATOS System Monitoring Room, Briefing Room**
- **ATC Stations (Confederate controllers)**
- **COTS Software that includes:**
  - MäK HLA RTI (Run Time Infrastructure)
  - MS Visual Studio
  - Rational Suite Developers Studio/ClearCase
  - Beyond Compare
  - TightVNC
  - Visual FORTRAN
  - DOORS
  - Satellite Tool Kit
  - Appropriate SW Licenses

Airspace & Traffic Operations Simulation (ATOS)



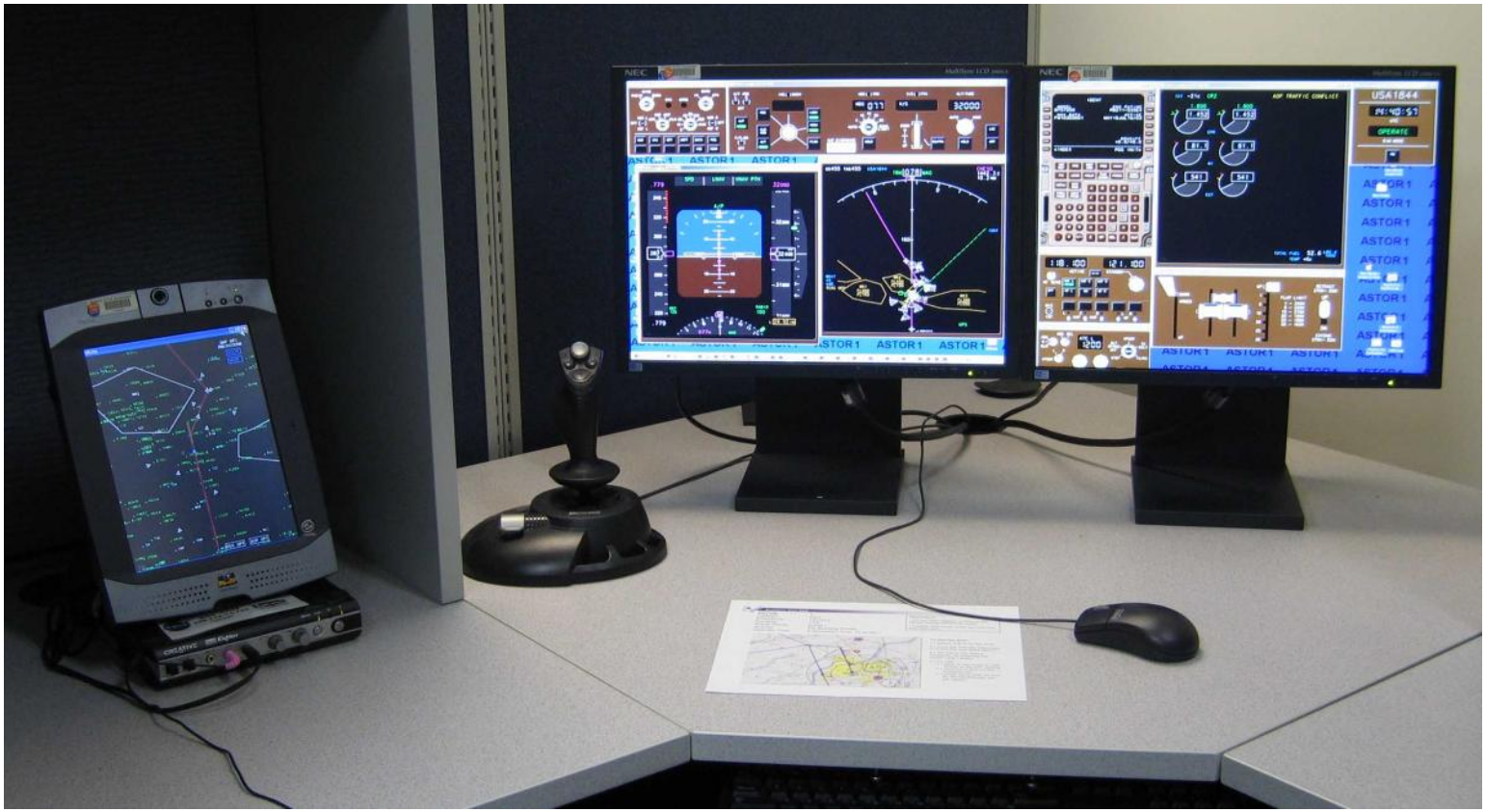
Multi-aircraft, multi-fidelity, air traffic simulation

Consists of the following:

- **ASTOR**s **(A**ircraft **S**imulation for **T**raffic **O**perations **R**esearch**)**
- Simulation Manager
- Scenario Generator
- Traffic Generator
- Pilot Models (for Batch mode)
- Spacing and Trajectory Generation Algorithms

ASTOR

Aircraft Simulation for Traffic Operations Research



Lab Configuration:

- **16 ASTOR Pilot Stations + 4 ASTOR Crew Research Stations**
- **>300 additional ASTOR computers with pilot model**

ASTOR Components

- 6-DOF Airframe models in real-time code
  - 757-200, 747-400
  - In progress: 737-300, 737NG, A320, 767-300ER, 777-200ER, MD-88
- Flight Management System (FMS) and Computer (FMC) Emulation
  - 777, MD-11
  - Advanced capabilities (e.g., wind fields, continuous descent approaches)
- Crew Interface – "Generic" Boeing Glass Cockpit
  - Primary Flight and Navigation Displays, including display control panels
  - Mode Control Panel, Control/Display Unit (MCDU), Radio (utilizes VoIP)
  - Additional "panel" incorporating controls for throttles, flaps, speed brakes, landing gear
- AutoFlight and AutoThrottle Systems Emulation
  - Tactical modes control (Boeing)
  - EFIS, EICAS, Autopilot, Flight Guidance
  - Thrust Management Computer
- Communication, Navigation, and Surveillance Emulations
  - GPS, INS Sensors
  - Automatic Dependent Surveillance – Broadcast (ADS-B)
  - Controller-Pilot Data Link Communication (CPDLC)
- ARINC 429 Avionics Bus Emulation
- Class III Electronic Flight Bag Emulation

ASTOR Crew Research Station (ACRS)

ATOS Build Development and Test

- ATOS build development and testing is performed by the contractor using it's own facility (and computing platforms)
- The contractor is responsible for ensuring that the software builds work in the ATOL
- The ATOL is the production environment used for experiment data collection.

Multi-Domain Nature of the Task

- Involves development and implementation of new or enhanced ATOS capabilities from high-level requirements provided by NASA researchers
- Design and implementation of algorithms (e.g. AOP and ASTAR) to support new operational concepts
- Subject Matter Expert (SME)
- Support for conducting experiments
- ATOL computer and network system administration and maintenance support

LITES

Procurement Specifics and Due Diligence for LITES

Robert J. Rice
Research & Projects Contracting Branch
Office of Procurement

Evaluation Factors

- Evaluation Factors
  - Factor 1: Mission Suitability
  - Factor 2: Cost
  - Factor 3: Past Performance
    - Written Proposal and Questionnaires are requested to be submitted 2 weeks prior to the submission of proposals
- Relative Importance of Evaluation Factors and Significant Subfactors
  - Mission Suitability, Cost and Past Performance will be of essentially equal importance
  - All evaluation factors, other than Cost, when combined, are significantly more important than Cost

Procurement Information

- Once the final RFP, NNL10276610R, is released, all communication must be in writing and directed to LaRC. LaRC focal point is Robert Rice or, in his absence, Rosemary Froehlich
- NASA Langley Research Center will be the Source Selection Authority
- Cost-Plus-Incentive Fee
- Single Source IDIQ will be awarded
- Task Orders will be issued

Procurement Information

- **Contract Period of Performance**
  - Base Period
    - Base period: 24 Months
  - Options: Three 12 month option periods (FAR 52.217-8, "Option to Extend Services")
  - Task Orders
    - Task orders can be issued up through the last day of the period of performance
  - Estimated Procurement Schedule (on or about):
    - Final RFP Release: December 8, 2009
    - Proposal Receipt: February 11, 2010
    - Contract Award: July 28, 2010
    - Phase-In Start: July 28,2010
    - Contract Performance Start: October 28, 2010

Government-Furnished Property (GFP) and Contractor-Furnished Facility

- Contractor is required to use ODIN for on-site desktop systems connected to LaRCNet
- Off-site connectivity to LaRCNet is by VPN
- Office space and furniture will be provided by the Government on-site at LaRC for contract performance when the Task Order requirements necessitate the Contractor's physical presence (approximately 100 work year equivalents (WYE) are currently on-site at Langley)
- Contractor is expected to provide a near-site facility for remaining WYE and all associated equipment and supplies
- Due to the developmental nature of this contract, special purpose hardware and/or software may be made available for use by the Contractor on a task order basis

Draft Request For Proposals

- NASA LaRC requests that prospective offerors give special attention to the following areas of the DRFP for potential comments:

  1. (MA4) Electronic Task Order Management Control System (DRFP page 56), which states:

  NOTE: THIS EVALUATION CRITERION MAY BE CHANGED OR DELETED IN THE FINAL RFP.

  - The Government is investigating possible Government-owned systems for use under this contract.
  - Offerors are asked to provide details on the demonstrated capabilities and the costs of current electronic systems of which they are knowledgeable.
  - This data will be used by the Government to help make its decision regarding the requirement for the LITES electronic system.
  - The Government will keep confidential all data received from offerors in this area.

Draft Request For Proposals (con't)

2. Direct Labor (DRFP page 61), which states:

   - NASA requests specific comments and recommendations regarding the labor descriptions and labor categories listed in Exhibit J and as reflected in Exhibit C, Schedule of Rates, of the Draft Request for Proposal.
   - In particular, the Government is interested in whether these categories reflect a reasonable specification of labor categories or are an over consolidation of differing IT categories.

Draft Request For Proposals (con't)

- NASA appreciates the expected comments to be received in response to the release of the draft solicitation.
- The comments are expected to result in improvements to both the quality and the content of the final RFP.
- In order to allow sufficient time for interested offerors to prepare questions after the conclusion of Due Diligence on November 23, 2009, we request that all questions and comments be submitted no later than December 1, 2009.
- A list of changes made to the draft solicitation and the list of attendees at this conference will be included on the NASA Acquisition Internet Service (NAIS) website.

Due Diligence

Due Diligence Period

- The objective of the due diligence period is to afford prospective offerors an opportunity to be come familiar with Langley Research Center (LaRC) and its relevant IT requirements
- Period is November 9 – 23, 2009
- Prospective offerors can meet with Task Assignment Monitors (TAM's) on current task assignments on ConITS contract
- Up to 4 people from each offeror team may be at LaRC at any given time – they do not have to be the same people for the entire 2 weeks

Ground Rules for Due Diligence

- The Government TAM may disclose the following information upon request
  - The type of work or product required
  - The types of equipment used
  - The current and projected workload
  - The Government's organization and role in the work to be performed
  - The current task areas supported by the incumbent contractor
  - Facts – avoid giving opinions
  - The approximate current task assignment value – not the Government estimate of the upcoming procurement

Ground Rules for Due Diligence

- The Government TAM may not disclose the following information:
  - Information proprietary or confidential to the incumbent contractor. This type of information includes employee names, salaries, fringe benefits, personnel policies, organization structure, subcontractors, and cost data such as burden rates.
  - The performance of an incumbent contractor
  - The information that will be in the final LITES RFP
  - If the TAM is uncertain or uncomfortable with answering a question, they will advise the potential offeror that they will consult with the Contracting Officer and get back to the offeror

Ground Rules for Due Diligence

- Meetings should be scheduled at the TAM's convenience, but between November 9 – 23
- The TAM's will be instructed to be as consistent as possible in the answers and the level of detail which is provided to each offeror
- The questions and answers provided during one-on-one discussions do not have to be provided to all potential offerors.
- The philosophy is that every potential offeror has an equal opportunity to ask questions.
- The TAM's will avoid giving personal facility tours.

Caveat and Caution!

- The questions and answers provided during one-on-one discussions will not be provided to all potential offerors.
- However, every potential offeror has an equal opportunity to ask questions and will be given the same level of information to the extent possible
- If any question or answer impacts the final LITES RFP itself, it will be sent out to all offerors
- TAM's have been advised to give facts, not opinions.
- **However, the offerors are cautioned that any opinions that might be given by the TAM's do not necessarily represent LaRC's position**

Tour

- 1:15 to 4:15 pm
- Building 1268 Complex
- Four persons per Contractor company
- Meet in R2120 at 1:15
- ATOL Presentation (R2120) 1:30—2:00
- 3 Groups Tour on a Rotating Basis 2:00, 2:45, 3:30
  - GEOLAB/DVAL
  - 2nd Floor Computer Rooms
  - ATOL Lab Tour